What's in this issue—

How much should you tell your employees and the public about your business? Charles R. Hook, president of the National Association of Manufacturers, tells you on page 267 how far he thinks you should go. He believes in taking the mystery out of business.

If you operate a job shop, you know what it is to have customers push you for quick deliveries. Boyar-Shultz Corp. is set up especially to meet such cases. Read on page 280 how they do it.

Galvanizers may not realize the importance that the **shape of the galvanizing pot** has to do with the results obtained. Wallace G. Imhoff, a recognized authority, describes on page 276 the various pot shapes and what influence they have on the work.

Britain hasn't waited until war is upon her to train her industries in the manufacture of armaments. She has **erected shadow plants** which are ready overnight to begin turning out war materials. How she has done the job is told by a special English correspondent on page 290a.

Did you know that **standards** have been established **for metallic electrodes for arc welding?** You will find all the data on page 289.

Pictures are used to bring you the story of how the **spider of the Hamilton controllable pitch propeller is machined.** It's a fussy job, because the finished part (made from an alloy steel forging) must combine high physical properties with extreme accuracy. Page 268.

Railroaders in particular will be interested in the account on page 279 of the **grinding of T-columns in a railroad shop.** We can't tell you here about the set-up. You'll have to read the description and look at the picture to get the details.

Gun manufacture is exacting work, as anyone who has visited a government arsenal will testify. We bring you on page 272 an account of how a **shrink-fit job on a gun mount was done** at the Watertown Arsenal.

A never-ending source of interest for readers is the department **"Ideas From Practical Men."** You will find it on page 187.

What will the **Army's 1939 supply bill,** rushed through Congress, mean to the metal-working industries? Our Washington office has made a close study of the bill and has discussed it with high Army officials. The results are printed on page 290e.

Much new equipment is being put on the market by machinery makers these days. In fact, more of it is being introduced now than was the case a year ago. Page 291.

COMING

In the next issue

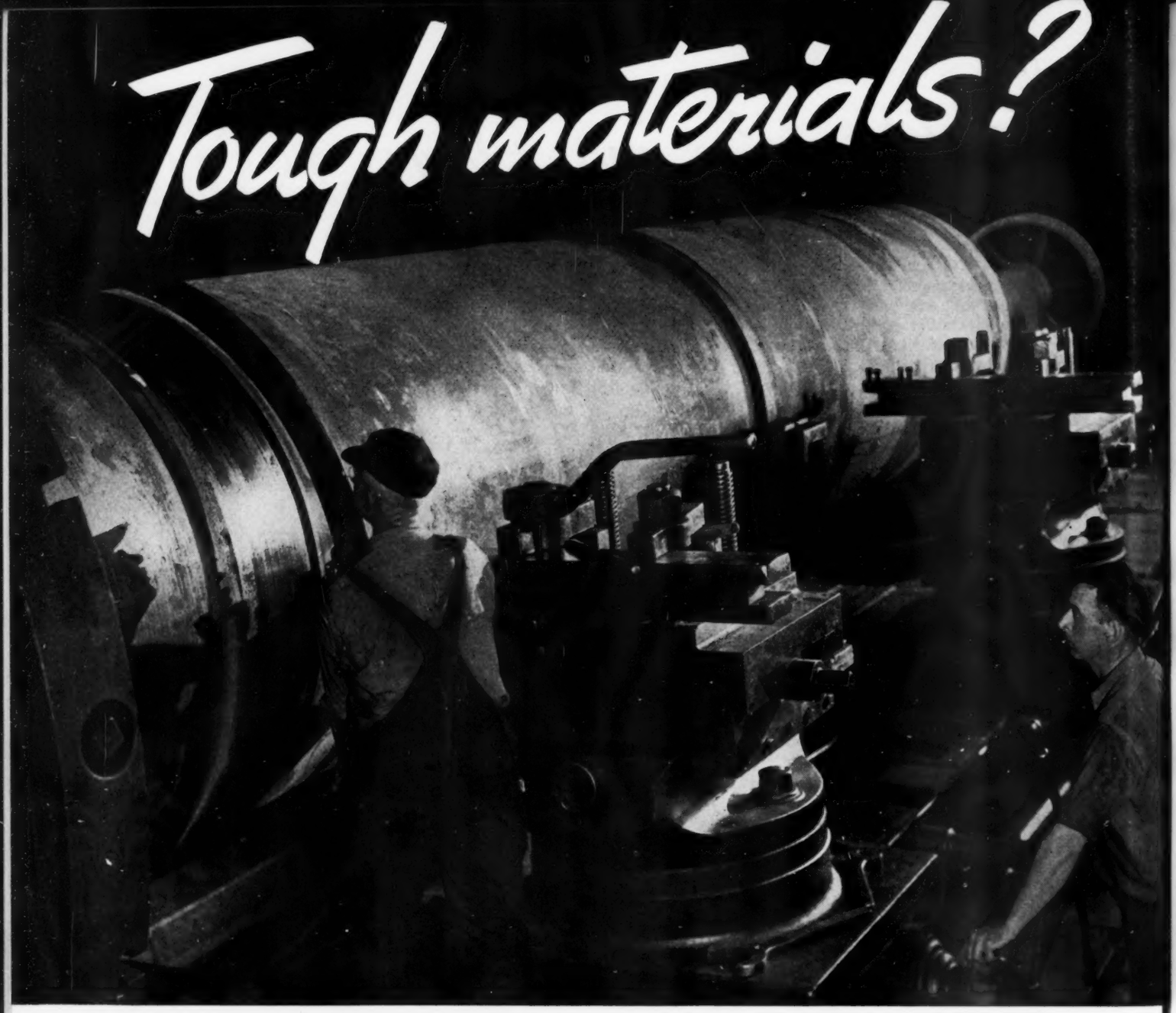
Tractor and farm implement makers are operating at about 75 per cent, which is in sharp contrast with most metal-working industries these days. Caterpillar is one of the active companies. It recently has installed a powered assembly line for its larger diesel tractors, thereby eliminating the hazards, congestion and inconveniences of the old system of assembly on manually-moved "dollies." A complete description of the new set-up, told mostly in pictures taken for *American Machinist*, will be in the next issue, dated April 20.

An eastern company has developed an inert gas compressor which makes possible the atomizing of molten metal at a cost as low as when compressed air is used. Tests have shown that the metal sprayed on steel surfaces, using inert gas, is compact, dense and contains few oxide inclusions. The details of this process will be revealed in our next issue.

In later issues

With streamline trains highballing it at 90 and 100 miles an hour these days, railroads are taking every possible precaution against failure of locomotive or car parts which might cause accidents. The matter of press fits is tied in with this precaution. One of our editors has recently visited shops around the country and has gathered original and valuable data on press fits which we shall pass along to you in an early issue.

Tough materials?



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AMERICAN MACHINIST

ESTABLISHED 1877

F. H. COLVIN • K. H. CONDIT • BURNHAM FINNEY, Editors

Britain Gives Us a Lesson

THOSE WHO ARE inclined to be smug and complacent about our ability to put ourselves quickly on an efficient war-time basis in a national emergency should read the account, starting on page 290a of this issue, of Britain's shadow plants and take heed of Britain's experience.

When Britain suddenly realized that armed force was the only thing which impressed the European dictators, it feverishly began a huge rearmament program. It recognized two all-important factors: that reserve munitions and armament capacity must be available for operation overnight if occasion demanded, and that such capacity would be ineffective and its output badly impaired for many months if industry were not properly trained to use it.

What good would plenty of factory capacity be, argued the British, if management and workers were not familiar with what to do with it?

So Britain started to erect its shadow plants in March, 1936. Not until February, 1938, or 23 months later, were most of the aircraft factories completed and the machinery installed. And the British felt that they had done the job in a surprisingly short time!

It was less than 60 days ago, then, that companies sponsoring shadow plants started production. It is reasonable to assume that it will be six months to a year before these plants are functioning smoothly on a mass-production basis.

It is a happenstance that Britain's regular aircraft factories are behind in deliveries to the government and that the shadow plants are to be used to take up the slack. Otherwise it had been the plan of the government to operate these plants on "educational orders" for about a year, after which they would be closed until needed in war time.

IN A WORLD heading toward war and in which heretofore remote distances have been startlingly shortened by air travel, are we to take no lesson from Britain? Obviously American industry cannot step up to an emergency and suddenly switch its production from peace-time goods to war materials unless it is tooled up for the job and unless its managers and workmen know how to do that job.

Congress cannot do better for the country's defense than to acquaint industry with its war-time duties by placing "educational orders" with key manufacturers. The financial outlay would be infinitesimal compared with what the government is actually spending for its armaments program and the results would pay for the expenditures many times over in the first month of any war in which we might become involved.

Gaging Business

SEASONAL factors have tended to stimulate mildly some of the metal-working industries, but otherwise signs of recovery are absent. The steel rate actually has risen more than seasonally, now hovering around 35%, but steel circles do not attach too much importance to this fact. The aviation industry is racing along at capacity. Other high spots are found among makers of tractors and farm equipment, among diesel engine builders, among manufacturers of business machines and in the southwest oil industry. Car makers are resigned to a 1938 output of less than three million units.

Auto parts makers are hard hit because customers have accumulated large inventories. Machine tool builders report domestic business scares. Foreign orders, mostly in connection with armaments programs, are helping to bolster operations; industrial machinery shipped abroad during February was 58% more than in the same month of 1937. Inquiries for equipment are plentiful but prospective buyers, lacking confidence in the outlook, seem unwilling to authorize capital expenditures except where necessary. Disappointed at the small rate rise, railroads are not expected to buy much equipment this year. National defense programs, army as well as navy, should provide substantial orders for metal-working companies in the coming months. Business Week's index is at 57.8, compared with 56.9 a month ago.

NEW ENGLAND — Diminishing inventories have mildly stimulated business. Machinery dealers report meager orders, but marine hardware shops are fairly busy, especially in non-ferrous metals. Private craft manufacture is stirring in shipyards. Electric motor sales show improvement. Boston Elevated Railway will build a machine shop and office at Everett, Mass., costing $1,000,000.

NEW YORK — The machinery market is still flat, customers refusing to transform inquiries into orders until they see signs of better times. Reports from Philadelphia are not encouraging.

PITTSBURGH—Steel mill operations have advanced more than seasonally. The breadth of demand, with miscellaneous users in almost all lines ordering in small lots, is the most encouraging feature. Local business activity is at 67.7 compared with 126.8 a year ago, according to the index of the Bureau of Business Research, University of Pittsburgh. Machinery orders have perked up and more companies are inquiring for equipment.

CLEVELAND—Though some companies have called back to work a limited working force, others have laid off additional men. Some equipment builders did better in March than in February, but feel that April will not touch the March total.

CINCINNATI — Machinery builders, with few fresh orders at hand, are working as many employees as possible on short time. In some cases March sales were ahead of February's, but the February volume was low. Busiest companies are those with foreign orders.

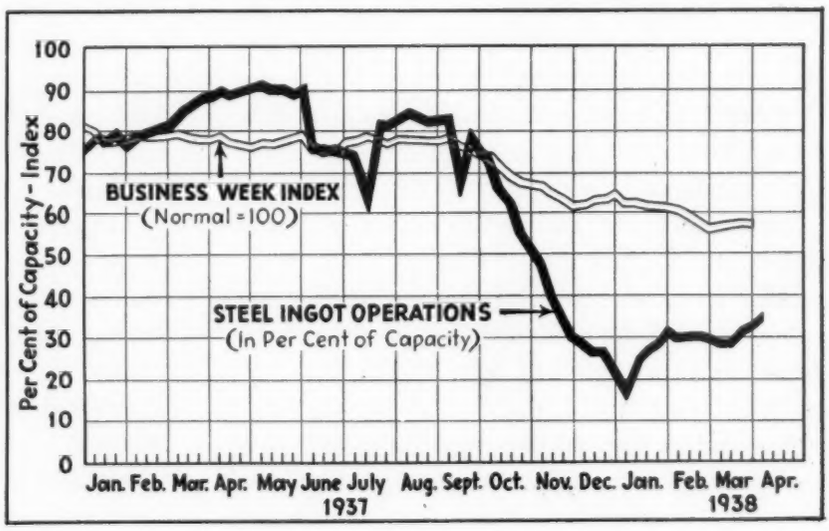
DETROIT — Dealers have made many machine tool quotations, but few orders are being closed. The supply trade is on hand-to-mouth basis, with no upturn in sight. Toledo production of auto parts is at low ebb.

CHICAGO—Railroads are buying practically nothing and have laid off more emloyees. Some carriers too have pared their budgets for track and equipment maintenance. The bad rail situation has adversely affected car-building companies. On the bright side, packaging machinery makers did a bustling first quarter business and electrical apparatus manufacturers are active. Agricultural implement and tractor companies are going along at a first-rate clip. Sales of agricultural goods have been partly responsible for a jump in steel wire orders.

SAN FRANCISCO—The slump was not felt here until two months after it struck nationally, consequently the Coast does not expect a quick recovery. Continuous expansion of this region, however, tends to cushion the shock of national business swings. Leveling off of the declining business curve and expenditures of 20.9% more by utilities for construction work this year than in '37 give some comfort.

STEEL OUTPUT VS. GENERAL BUSINESS

Steel about-faced after a swift rush to the bottom, and its gains in recent weeks indicate a gradual return to a more healthy level of business



Take the Mystery Out of Business

CHARLES R. HOOK
President, National Association of Manufacturers and President, American Rolling Mill Co.

ONE OF THE greatest responsibilities confronting industry today is that of self-interpretation. More than ever, men who are actually engaged in working and managing must look into what they are doing in order to discover the best ways in which to explain our American system to the general public. We must observe clearly, think clearly, and then speak clearly.

This self-scrutiny, this constant analysis of aims and position, lies at the base of any sound attempt of industry to tell where it is going and why. And the telling of that story is vital today, when industry is under attack from many sides.

A prime necessity today is better understanding between business and the individual under the present system. Those of us who have had practical experience in the operation of this system—the profit system or system of private enterprise—should be best fitted to interpret it. The businessman should come out of his shell at every opportunity and play the role that is rightfully his. He has a very compelling story to tell, and he should tell it.

In this educational process, management has a particularly important part to play. It has the duty and the privilege of informing its employees, showing them how the simple laws of business economics apply to what is happening in each individual plant.

Some there are who say that the employee doesn't want to hear from his boss—that he won't listen to him anyway. Fortunately, there is an answer ready at hand for such doubters.

A survey of employee opinion which has recently been made by the National Association of Manufacturers shows very conclusively that most workers do want to hear from their employers about business. The survey pointed definitely to a trend that too few people have realized—a trend indicating that the worker wants information on policies and happenings affecting his well-being, his job, his future.

With this in mind, management should increase its efforts to take the mystery out of business, both as it relates to the public and the employee. There are many questions which any wide-awake workman would like to have answered for him. What are the problems of business? Are we making both ends meet? If not, why are we failing to do so? What is standing, or is likely to stand, in the way of future progress? If he feels that these are being answered fairly, the workman will have more confidence in the company for which he works, and he will possess more of a community of interest with his employer.

In its relations, too, with the general public, American industry should adopt an open book policy. It should constantly keep the public informed about its present accomplishments and future objectives; and the best part of industry's story, the part which explains what industry means to society, should certainly not be neglected.

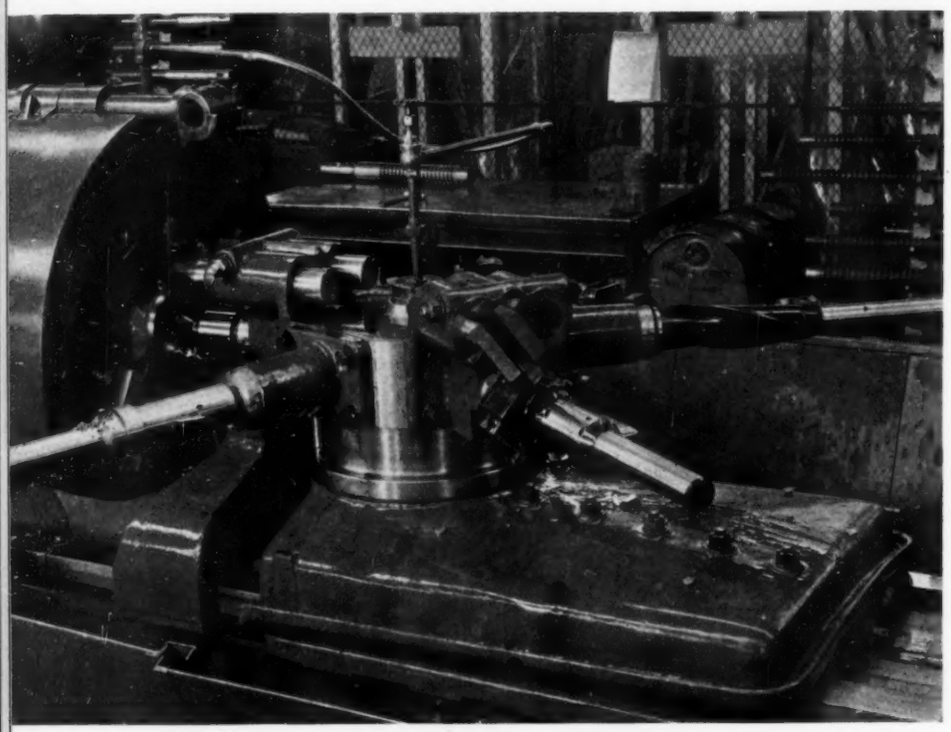
Careful self-analysis should precede this telling of industry's story. And when, in the course of this, abuses and improper business practices are discovered, industry must show the good faith to expose these and stand out against them. That takes courage, but so does almost everything else that is really worth doing.

That is the real way to win the confidence both of the public at large and of our own employees. Industry has a magnificent story to tell. It is an integral and fundamental part of the country's whole pattern of existence. It is responsible for our progress in the past; in its further progress lies the hope of the future. More effort should be made, and effort should be made in more ways, to point out industry's relation to society as a whole.

An open book attitude on the part of individual businessmen, together with intelligent cooperation by all industry, is the only way to encourage public understanding and appreciation of the industrial incentive system.

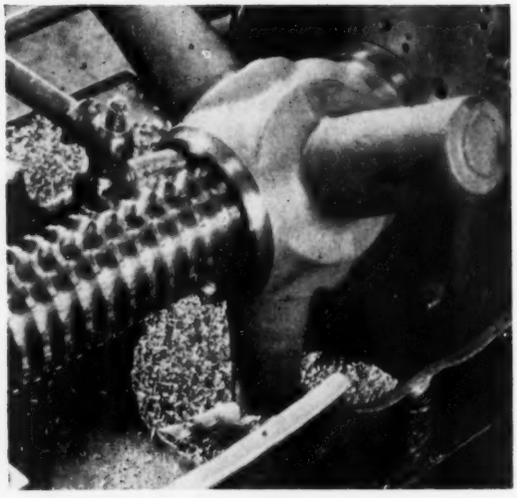
The development and maintenance of that attitude is one of industry's greatest social responsibilities today.

Controllable Pitch



III—This is the third of a series of views showing machining operations on the Hamilton controllable pitch propeller. Previous pages have shown how machine set-ups are made for performing work on the blade and hub barrel. Shown here are the machines and tooling employed in making the spider and counterweight bracket.

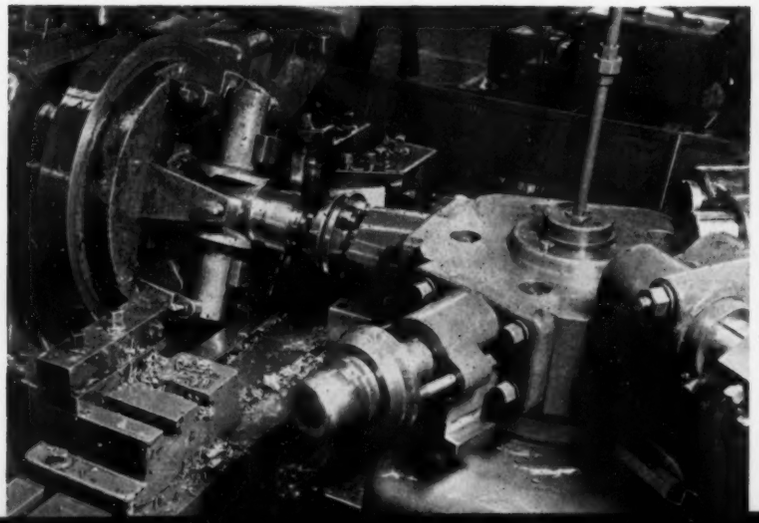
The spider is mounted in an electrically operated self-centering chuck for the first machining operation. A Potter & Johnson machine roughs and finishes the bore, faces the hub and roughs out the tapered seats. The workpiece is reversed in a second set-up for operations on the opposite end

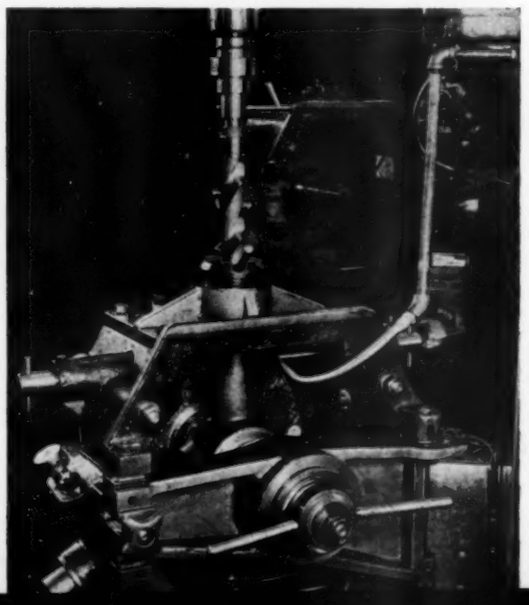


Left. **The spider bore is splined by broaching. Two operations are used on a La Pointe machine to hold spline width limits to 0.0005 in.**

Left below. **Spring backed cones fit into the tapered seats while the hub diameters are rough and finish formed and faced. The tapered seats are finished at another station of the same turret lathe set-up to insure concentricity. The spider shown is for a two-blade propeller**

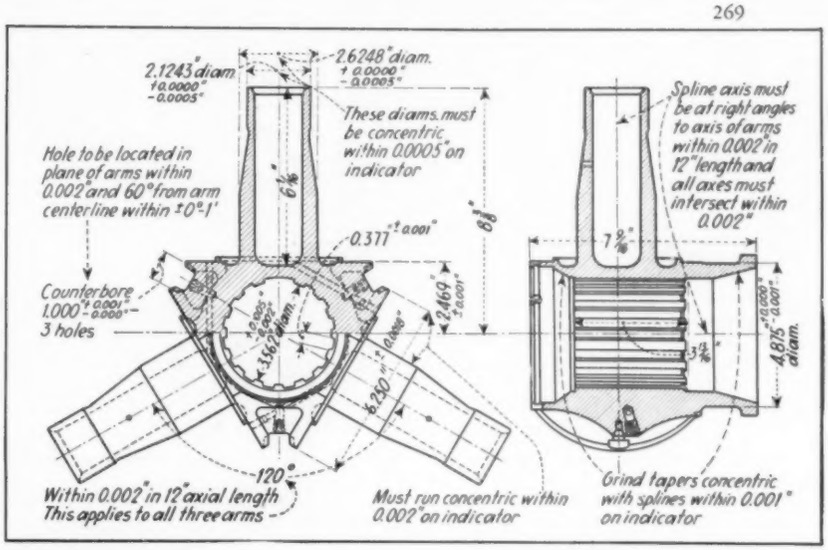
Right below. **With the spider located from the bore tapers in an indexing jig, the arm holes are drilled and faced to length. The center is chamfered and another center drilled in the piece opposite each arm. Note that the coolant is supplied below the drill bushing**

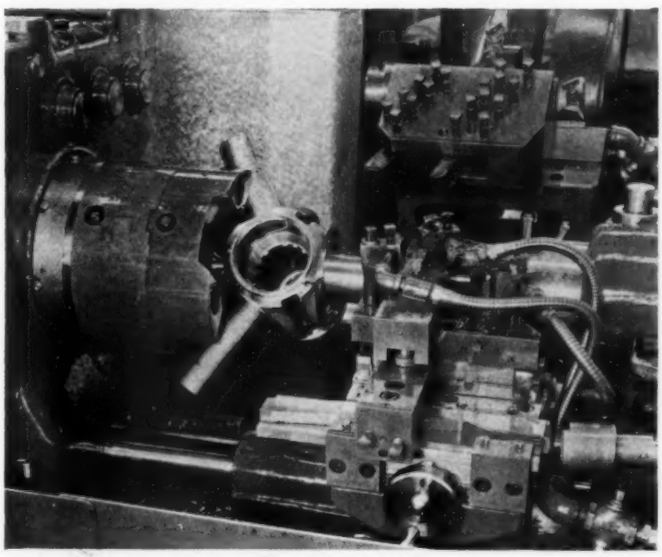




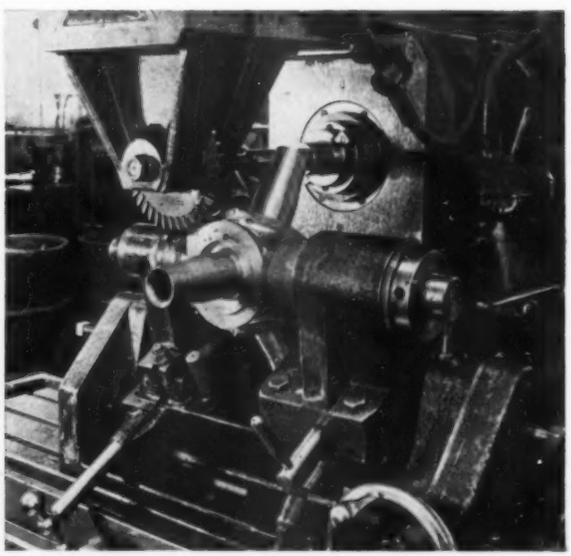
Propellers in Process

The spider is the driving member of the propeller. Its arms fit into the blades, force them through the air when the plane is in operation. All the lifting power of the engine is transmitted through the spider. In conjunction with the barrel, the spider locates the blades. Thus it must combine high physical properties with extreme accracy. The spider is made from a chrome-nickel molybdenum forging, heat-treated to about 395 Brinell. Its arms must be at right angles to a splined bore within 0.002 in. in 12 in.; their main dimensions must be within plus 0 and minus 0.0005 of size and concentric within the same limits. Their axes must meet at the hub centerline within 0.001 in. A Magnaflex test provides a means of detecting any flaws in this member before it passes final inspection


2.1243" diam. +0.0000" -0.0005"
2.6248" diam. +0.0000" -0.0005"
These diams. must be concentric within 0.0005" on indicator
Hole to be located in plane of arms within 0.002" and 60° from arm centerline within ±0°-1'
Counterbore 1.000" +0.001" -0.000" 3 holes
0.311" ±0.001"
2.469" ±0.001"
6.250" ±axes
120°
Within 0.002" in 12" axial length This applies to all three arms
Must run concentric within 0.002" on indicator
Spline axis must be at right angles to axis of arms within 0.002" in 12" length and all axes must intersect within 0.002"
4.875" +0.000" -0.001" diam.
Grind tapers concentric with splines within 0.001" on indicator

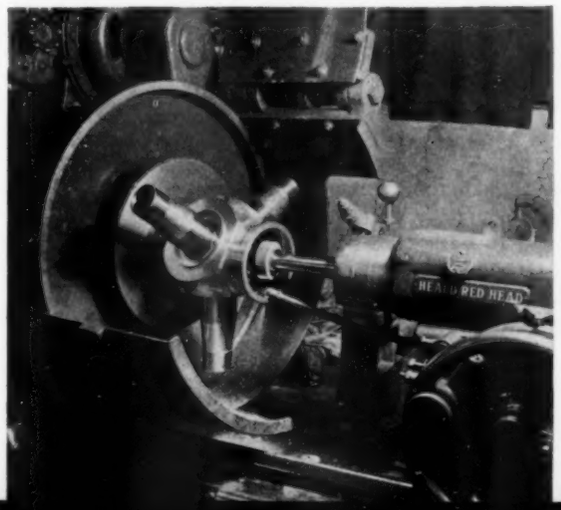


For turning the arms the spider is mounted on centers in a Fay automatic lathe. The front slide tools are cam guided to form the arm tapers while the rear tools do the facing

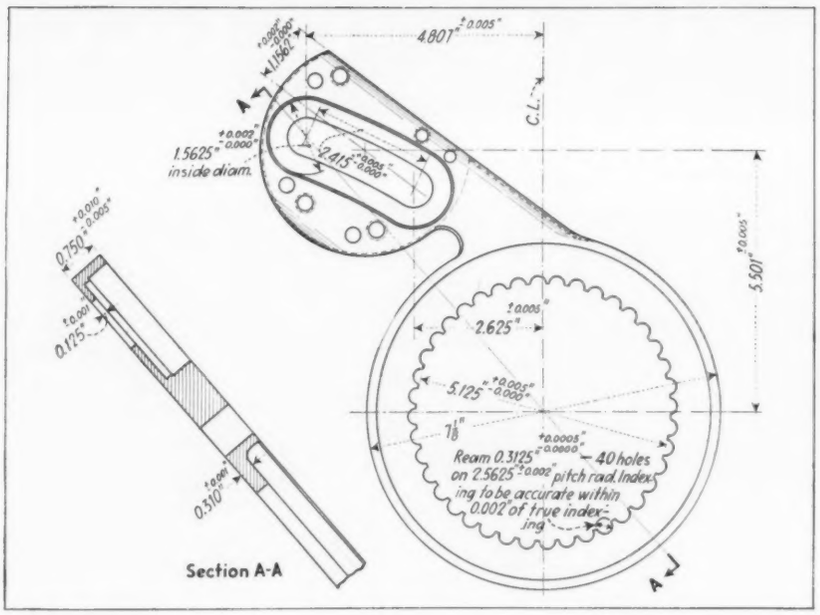


A pivoted fixture indexes, spaces and rocks the work while chamfering cuts are taken between the spider arms. Altogether 21 separate milling cuts are required to complete this operation

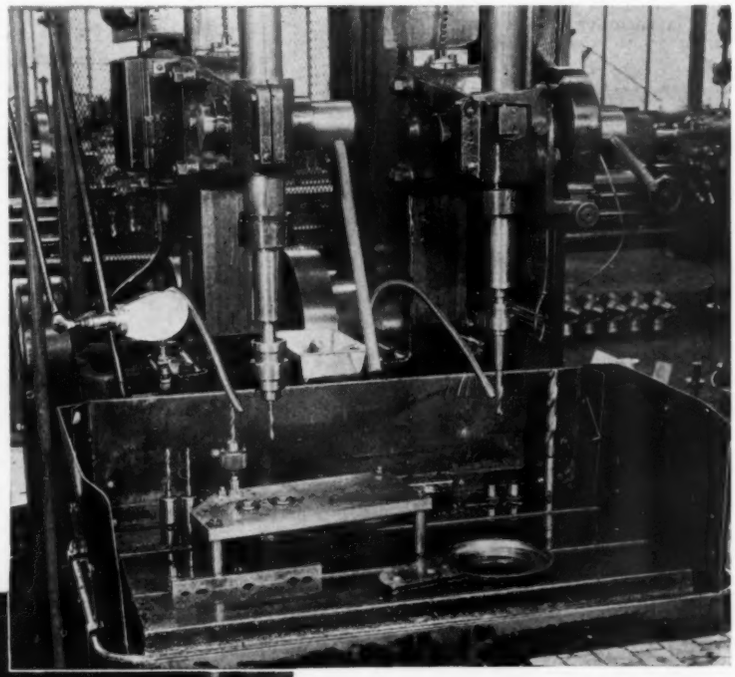
Tapered seats are finish ground on an internal grinding machine with the workpiece chucked from the spline. These tapers must be concentric with the bore and must show a bearing all around when checked with Prussian blue



An inspection fixture tests the alignment of the arms and bore. Ground balls fitted into the arm seats are checked for vertical and horizontal positions by means of dial indicators

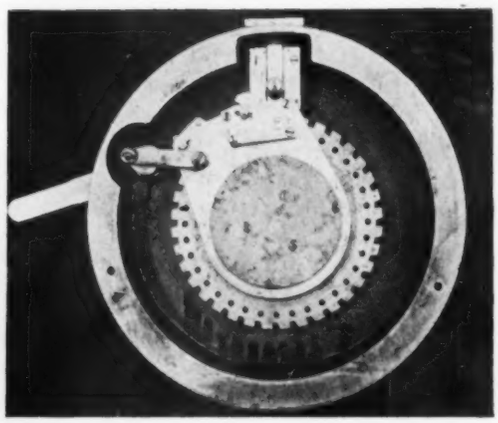


Since the counterweight bracket is one of the major links in constant speed propeller control its dimensions must be maintained to close tolerances. For instance, the half holes used for indexing the bracket at assembly must be within 0.002 in. of correct spacing, within 0.002 in. on the pitch diameter and within 0.0005 in. of exact size. This member has a weight tolerance of plus or minus 0.02 lb. It undergoes a Magnaflux test to detect flaws before cadmium plating. The design illustrated permits a 20-deg. automatic pitch variation on the blade. The part is a chrome-vanadium steel forging heat-treated to 305 Brinell and 135,000 lb. per sq.in. ultimate tensile strength

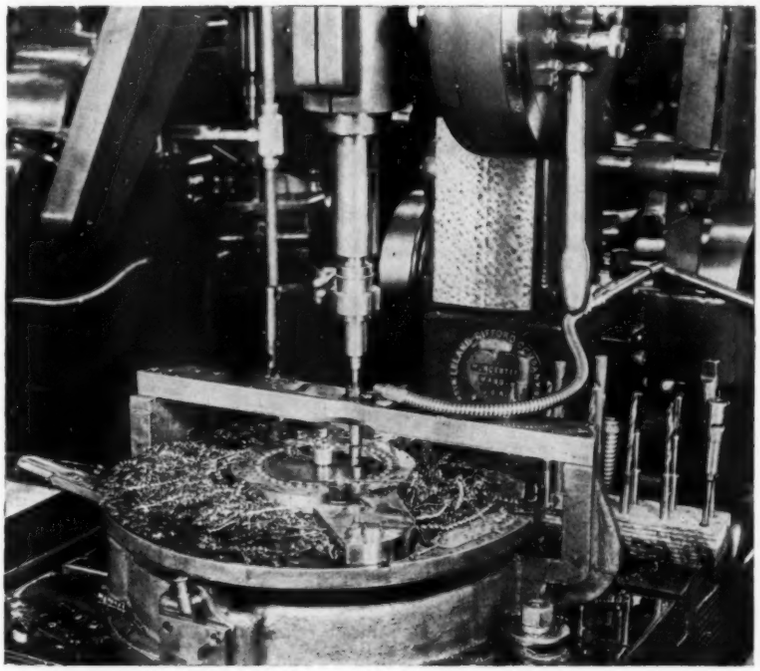


After the counterweight bracket is surface ground on both sides and turned in a Fay automatic, eleven holes are jig drilled and reamed in a two-spindle machine. The workpiece is located under a plate jig mounted on legs to give drill clearance

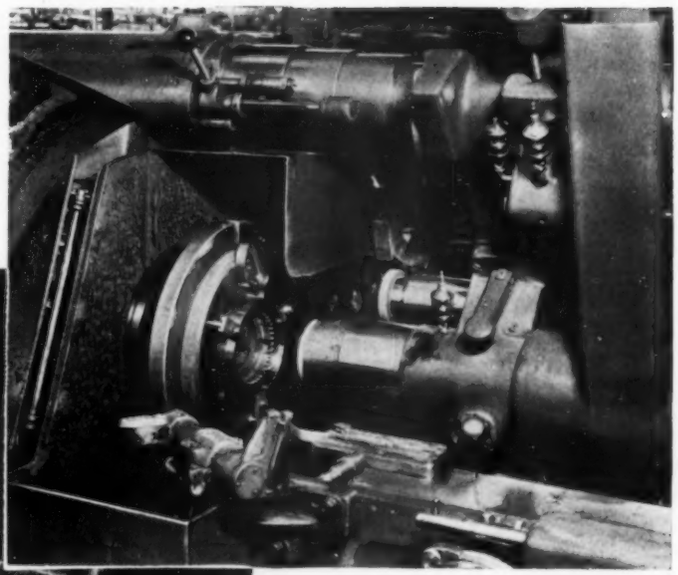
Outside edges of the counterweight bracket are machined on a rotary table in a Milwaukee mill. Four separate operations are required



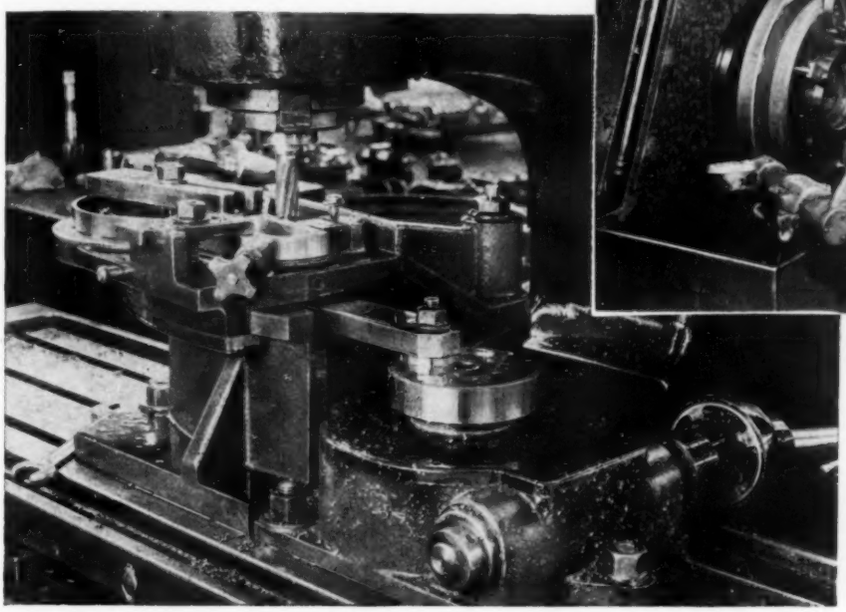
Forty holes are drilled on an indexing fixture with the bracket located from the bore. An extra long bushing is employed to insure precise spacing



The 40-hole jig is provided with an indexing arm and a positive stop. An escapement mechanism provides rotation in one direction only



Radial slots are cut in a vertical milling machine with the bracket clamped in a pivoted fixture. Feed is obtained by means of a worm driven crank arm. Rough and finish cuts are taken on both large and small slots

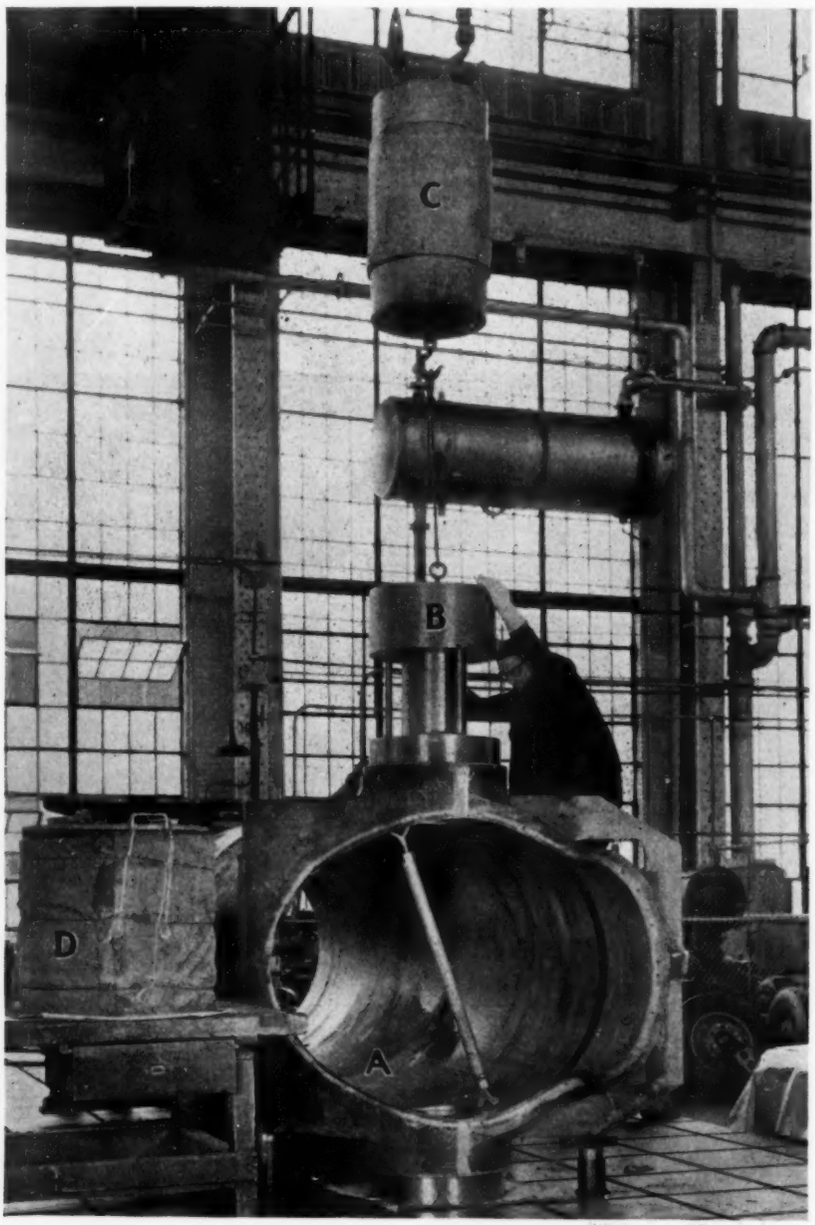


The bore, inside of the flange and face are ground in a double-head Bryant special grinder

Acetone-Dry Ice Method of Assembly

Expansion fits prove practicable in making gun mounts where heat would be likely to cause distortion

J. F. MAGUIRE
General Foreman, Watertown Arsenal



EXPANDING a trunnion extension to the cradle is done in the general set-up shown in Fig. 1. The cradle *A* is a steel casting weighing approximately 30 tons. This casting is completely finish machined.

The crade extension *B* is a steel forging weighing approximately 1200 lb. This forging is finish machined except for an opening for an antifriction device which is machined in place after assembly.

Wire slings with hooks are attached to two ¾ in. eyebolts that are secured into the top face of the trunnion extension. The weight *C* (approximately 4000 lb.) is attached to the crane hook with a separate sling, while the sling that holds the trunnion extension is attached to the weight.

This hook-up is necessary to insure rapid handling of trunnion extension from the freezing bath to its place in the cradle and to set the weight in place quickly with the same crane lift.

The tank *D*, made of ¼-in. structural steel plate, is 29 in. I. D. by 29½ in. deep and has a capacity of 84 3/10 gal. The tank is insulated by wrapping about 1-in. thickness of burlap and paper around the outside. A wooden cover is provided to seal the opening in the tank, and a small cover is provided in the large cover, through which dry ice is charged into the bath.

Before submerging the trunnion extension in the freezing bath, the finished surfaces and bolt holes were

Fig. 1—A weight of 4000 lbs. is held on the crane lift and in turn supports the cradle extension to facilitate rapid handling

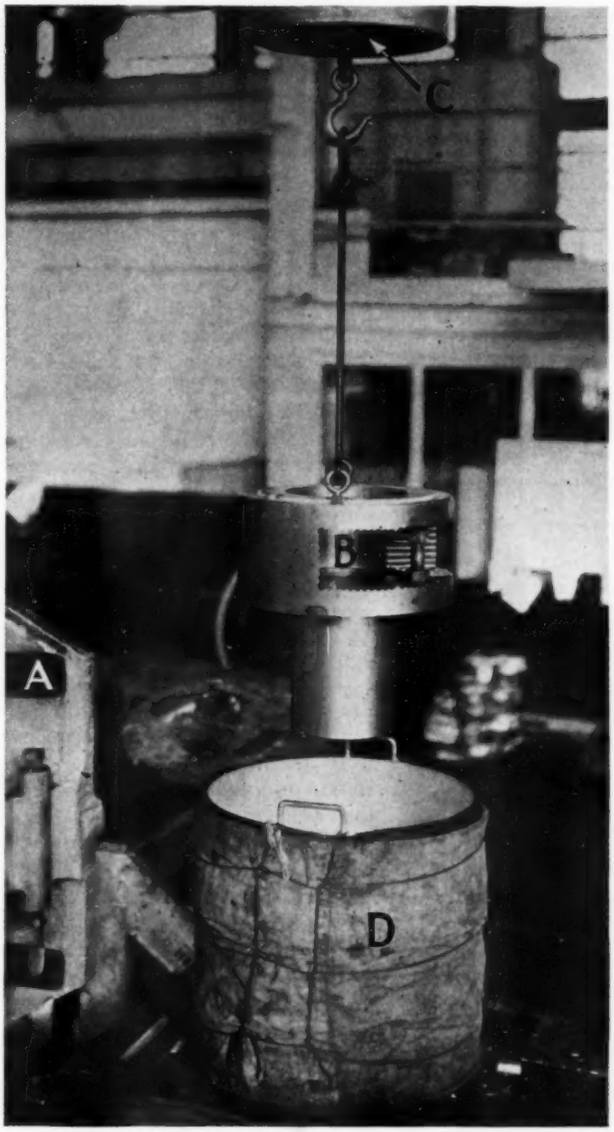


Fig. 2—The bath reaches a temperature of —90 F. before the piece is removed preparatory to expanding it in the cradle

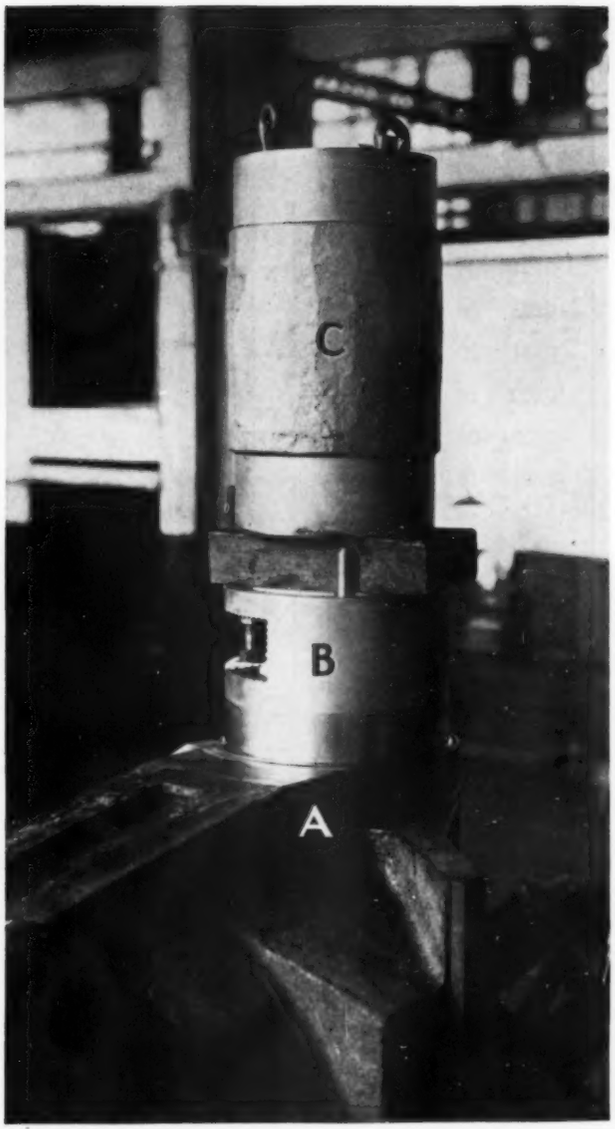


Fig. 3.—The weight is left in place until the cradle and extension have returned to room temperature in order to secure a tight fit

coated with a thin filament of kerosene and machine oil to prevent the formation of frost. The trunnion extension was next set vertically in the tank, allowing the acetone to cover completely the surface up to 4 in. above the section to be shrunk. Dry ice was then charged into the bath until the required amount of shrinkage was obtained.

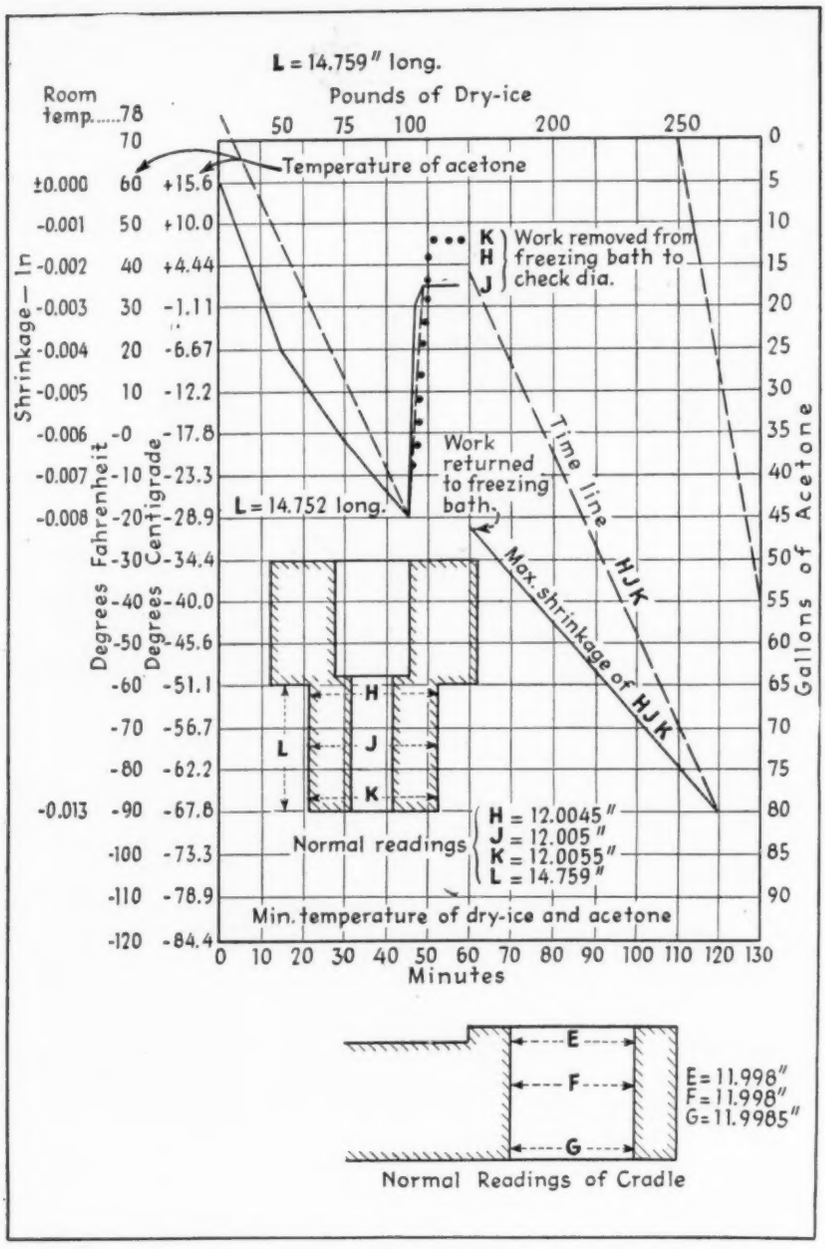
The piece was then removed from the bath by means of an electric crane and lowered into trunnion hole in the cradle. Guide bolts are provided to align the piece in proper location. The weight *C* is next lowered to rest on the trunnion extension and is left in this position until cradle and trunnion extension have returned to room temperature.

As it is desired to pinch the shoulder of the extension at the junction of the outer edge of the cradle trunnion first, dry ice is packed into the hole in the cradle extension to within 4 in. of the shoulder. This is done to retard expansion at the bottom of the spindle until the shoulder at the junction of the flange on the cradle extension has expanded first.

Measurements of the cradle extension before freezing, allowing 0.0065 in. interference for shrinking:

Cradle Diameter of hole	*Trunnion Extension Diameter of Spindle*
$E = 11.998$	$H = 12.0045$
$F = 11.998$	$J = 12.004$
$G = 11.9985$	$K = 12.004$
	$L = 14.759$ long

1. Room temperature +78 F. Temperature of acetone +60 F. Time 10:05 a. m.
2. Trunnion extension placed in freezing tank at 10:05.
3. 50 lb. of dry ice charged into the bath during the next 15 min.
4. Temperature test taken at 10:20 and found to be +20 F.
5. 25 lb. of dry ice charged into the bath during the next 15 min. Temperature test taken at 10:35 and read — 2 F.
6. 25 ib. of dry ice added during the next 15 min.
7. Temperature of bath taken at 10:50 and read —20 F.
8. The trunnion extension was removed from the bath at this time and micrometer measurements taken at sections *H*, *J* and *K*. Also, measurement was taken at *L* to find out the change in



Time—Temperature Chart of Part immersed in Acetone-Dry Ice Bath

length. The results showed that the diameters had shrunk 0.008 in. below original diameter and the length had shortened 0.007 in.

9. The piece was then returned to the freezing bath and 100 lb. more of dry ice added. At the end of 15 min. the temperature of the bath was —39 F.
10. Temperature reading was again taken in 15 min. and showed —50 F.
11. Last temperature reading taken at 12:05 and showed —90 F.
12. The extension was next removed from the bath and micrometer measurements taken at sections *H*, *J* and *K* and showed that piece shrunk 0.013 in. below original diameter.
13. The cradle extension was then lowered into place in the cradle.
14. Time required for complete operation, two hours.

15. 50 lb. dry ice in 15 min. reduced temp. of bath to +20 F.
    75 lb. dry ice in 15 min. reduced temp. of bath to — 2 F.
    100 lb. dry ice in 45 min. reduced temp. of bath to —20 F.
    100 lb. dry ice in 1 hr. reduced temp. of bath to —22 F.
    250 lb. dry ice in 2 hr. reduced temp. of bath to —90 F.
16. 1.5 lb. of dry ice equals 1 F.
    2.81 lb. of dry ice equals 1 C.
    4.63 lb. of dry ice equals 1 gal. of acetone
    10 deg. change in temperature equals 0.001 in. shrinkage

While it is realized that these figures will not apply to pieces of different sizes, it proves that the process of reducing diameters of male parts, such as bearings, shafts or bolts by the acetone-dry ice method is an easy, economical way to assemble where a shrink fit is required and especially when the parts to be assembled are completely finish machined, and heating of the female part would be detrimental due to possible distortion.

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Welding Low-Alloy Steels

The major problem in welding the low-alloy steels is to obtain a joint that is tough under shock as well as under quiet load. Under some conditions a zone adjacent to the weld may be obtained that is considerably harder than unwelded steel. In unalloyed steel an increase in hardness is accompanied by a loss in toughness. The low-alloy steels, however, remain tough despite a similar increase in hardness. In this fact lies their usefulness.

The problems that, in the past, have beset the welder of low-alloy steels have practically disappeared. Strength and soundness are merely a question of choice of welding rods and methods. It used to be thought that more trouble with shrinkage would be encountered with low-alloy than with unalloyed steel. It is a fact, nevertheless, that the low-alloy steel, since its high strength permits the use of thinner plates, involves the welder in no shrinkage problems not encountered in unalloyed steel.

Dr. A. B. Kinzel, Union Carbide and Carbon Research Corporation, classes as foolproof those steels containing less than 0.15 per cent carbon and having a strength below 80,000 lb. per sq.in. providing the thickness is not excessive. Steels containing a higher percentage of carbon but not exceeding 95,000 lb. per sq.in. in strength likewise may be used with complete satisfaction if the welds are relieved of shrinkage stress by heat-treatment.

From a paper presented before the eighteenth annual meeting of the American Welding Society.

Practical Pin Measurement

In making corrections for over- or undersized pins it must be remembered that the contact angle varies from the pressure angle according to the number of teeth in the gear

FRANCIS W. SHAW
Tool and Gear Consultant, Broadley, Whitworth, England

IN FORMULATING his rule for computing the allowance to be made on the over-pin measurement when the pin diameter does not tally exactly with that given in the tables, John Apelskog (*AM*—Vol. 81, page 842) has evidently assumed that the pin always has contact with the tooth profiles at an angle equal to the pressure angle. This, however, is true only for the infinite gear—the rack, and when the pin center lies in the pitch circle. A little study of the accompanying diagram will reveal that the tooth number has a vast influence on the contact angle.

The simple rule to allow five times the difference between the theoretical pin diameter and the actual pin diameter therefore fails, and as shall be seen, fails badly. The alternative, though a little more complex, is by no means difficult.

The theoretical angle of contact α can be determined through the nominal pressure angle α, the pitch diameter D and the diameter D' of the circle containing the centers of the pins by the formula

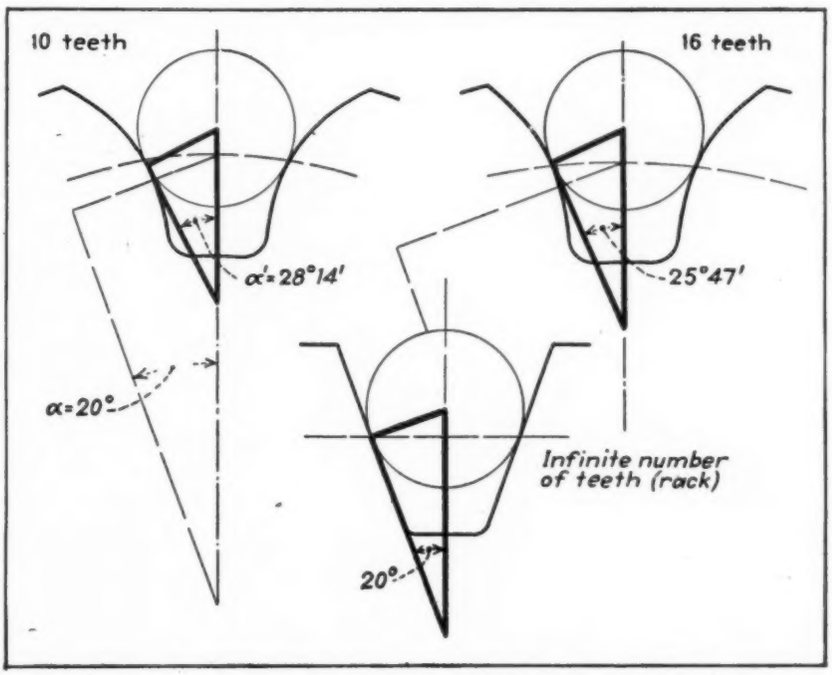
$$\cos \acute{\alpha} = \frac{D \cos \alpha}{D'}$$

Thus, for a ten-tooth gear of $14\frac{1}{2}$ deg. pressure angle, the pin circle of which, according to Mr. Apelkog's table, is 12.415 — 1.750 = 10.665,

$$\cos \acute{\alpha} = \frac{10 \times 0.96815}{10.665}$$

$$= 0.90778 = \cos 24 \text{ deg. } 48 \text{ min.}$$

For a 16-tooth gear, a similar calculation places the contact angle at 22 deg. 6 min. Both angles are noticeably in excess of $14\frac{1}{2}$ degrees.



Contact angles between pin and gear are shown for a ten-tooth gear, a sixteen-tooth gear and a rack

Let, now, a denote the difference between a standard pin and that of the nearest tabular pin; then the difference x in the over-pin diameters can be determined by the formula:

$x = a$ (cosec $\acute{\alpha} + 1$)
When $a = 0.001$ in,
$x =$ (cosec $\acute{\alpha} + 1$) in 0.0001-in. units.

Example: What over-pin allowance must be made when the pins of 1.750 diameter, tabulated for 1-pitch gears, are replaced by pins 0.005-in. either under- or over-size, the numbers of teeth being 10 and 16? Pressure angle = $14\frac{1}{2}$ deg.

We have already determined that the contact angles are: for 10 teeth — 24 deg. 48 min.; for 16 teeth — 22 deg. 48 min. For each 0.001 in. in the pin diameter.

$x =$ (cosec 24 deg. 48 min. + 1) (for 10 teeth)
$= 2.384 + 1 = 3.384$ thous.
$x =$ (cosec 22 deg. 6 min. + 1) (for 16 teeth
$= 2.658 + 1 = 3.658$ thous.
$x =$ (cosec $14\frac{1}{2}$ deg. + 1) (for rack)
$= 4 + 1 = 5$

The allowance for 0.005 in. will therefore be:

10-tooth gear: $3.384 \times 5 = 16.9$ thous.
16-tooth gear: $3.658 \times 5 = 18.3$ thous.
Very large gear: $5 \times 5 = 25.0$ thous.

These small values would be added to or deducted from the corresponding tabular over-pin diameters.

The diagram illustrates the corresponding changes in the contact angle for 20-degree gears.

Why So Many Galvanizing-Pot Shapes?

Many influences have been responsible for lack of standardization of hot-dip galvanizing pot shapes, but the trend is toward fewer basic designs

WALLACE G. IMHOFF
Technical Director of Research
American Hot-Dip Galvanizers Association

IF ONE SHOULD begin a study of hot dip galvanizing pots, there are a number of questions that would immediately come to mind. For example:

How many shapes of pots are being used?

Why are so many shapes being used?

Is there one shape that is more common than others, and why?

When concentrating on the subject of hot-dip galvanizing pots, I was surprised to find so many different shapes in use. At least eleven different types were encountered, but there are more. Most of the common shapes are shown in Figs. 1-12. Then there are odd shapes such as: pots that are bigger on one end than the other; pots that are deep at one end and shallow at the other end; pots that are very narrow U-shaped, and reversed flange steel patterns that are very wide. Doubtless there is an explanation for every shape found.

Fields of Use

Aside from the fact that there is apparently no scientific basis for galvanizing pot shapes, a study of the pots encountered reveals what might be called "unknown factors". The first and most important factor is the field of use. There are a number of distinct fields for galvanizing—sheets, pipe, wire and wire products, structural steel, metalware, pole-line hardware, range boilers and tanks, malleable and cast-iron fittings, job galvanizing and miscellaneous galvanizing.

Contrary to what might be thought, galvanizing is a very difficult operation when both the cost of production and the quality of the product are considered. Unlike other fields, galvanizing almost defies standardization, the nearest thing being to classify galvanizing operations into the different fields. All the pots for the sheet industry, for example, are not the same, and there is an even wider variation in the shape of pots used in the pipe field. Nevertheless, this fact stands out—most sheet pots are square in shape, while most pipe pots are long, or rectangular in plan, while small work like castings is done in a smaller pot.

Work Affects Pot Shape

The shape of a galvanizing pot is basically affected by the type of the work; that is, the size of the article, its shape and weight, and the production per hour desired. Production may be given in pounds per hour or in dozens or numbers of pieces. Structural-steel production is given in pounds per hour, while production statistics for metal-ware galvanizing are given in dozens or numbers.

In any discussion on the shape of galvanizing pots it is necessary to consider the human element connected with galvanizing. For years the only persons who actually knew about practical operation and technique of galvanizing were either foreign labor or colored labor. The practical operators found out valuable information, and management in many cases got its ideas directly from the men. This situation gave rise to many different ideas as to correct shape of the galvanizing pot.

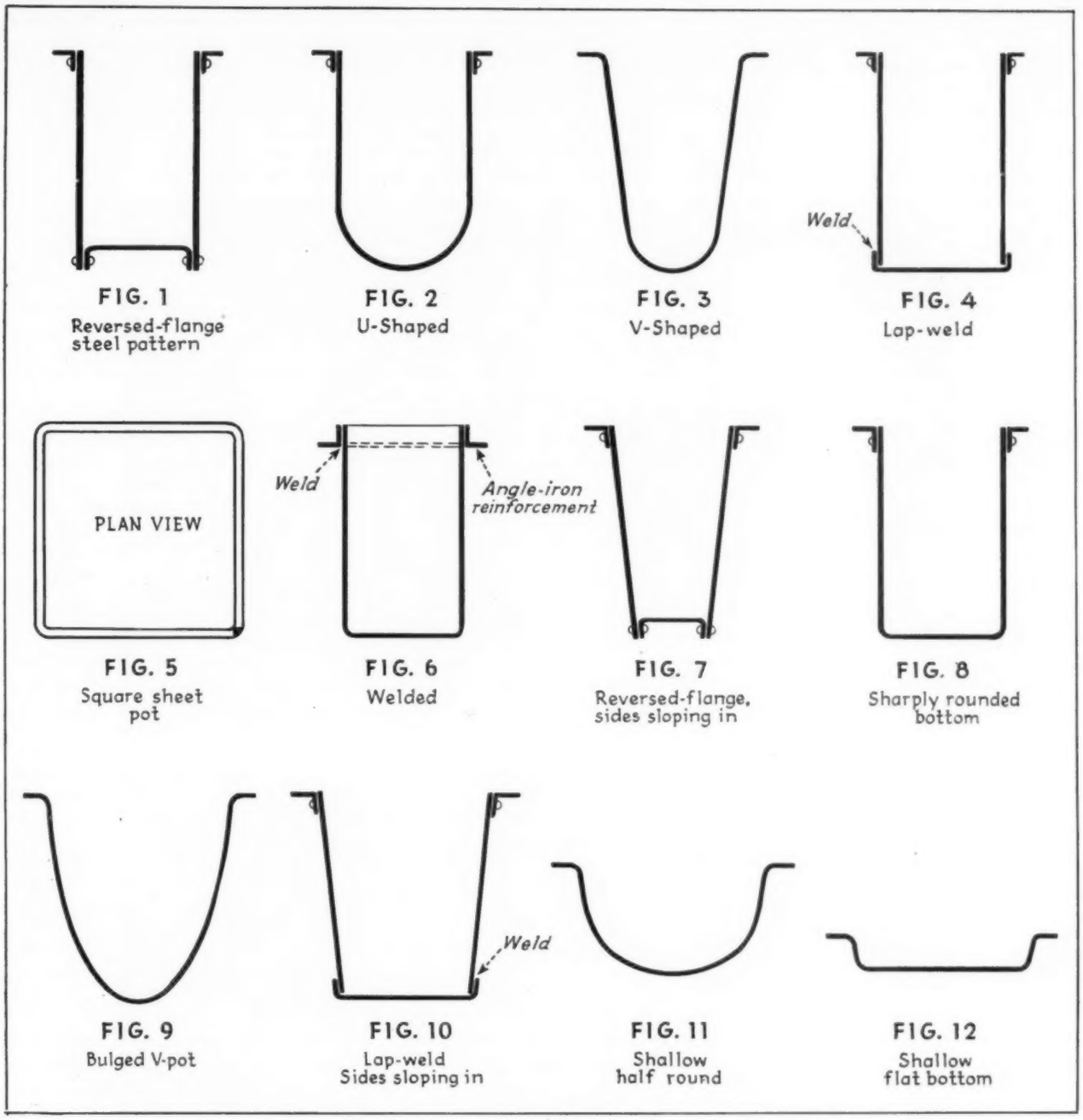
Then there were managers who had their own ideas as to the shape of galvanizing pots. Their ideas were based on overhead, pot failures, fuel consumption and costs. If one shape and design of pot failed, another was tried. The success of the new pot may have been entirely due to a change in galvanizing foreman, but so long as the pot used gave better service, that shape was held to as the best.

Many New Furnaces

Pot shape and design have also been influenced by furnace companies and their engineers. In the last three or four years many new kinds of galvanizing furnaces have been placed on the market. Some offer one thing, some offer another, and the size and shape of the pot are made to fit in with the new ideas.

Still another group that has influenced galvanizing furnace design and construction are the specialists who have concentrated in the field of galvanizing, or the engineering staffs of large corporations. The salesman of each type of fuel also has had convincing arguments for the superiority of his product, especially as applied to heating galvanizing pots, and so the shape of the pot, the size of the pot and the furnace design were all touched upon with the fuel engineer's ideas. If we go back far enough we will find that the authority on the galvanizing furnace was none other than the company bricklayer. It was he who said what shape of pot to be used, and who gave the specifications for its size and other factors.

To get at the facts of the case there are really four distinct fields of engineering involved. First, there is



These cross-sections of galvanizing pots were discovered in use, but Figs. 1 and 5 are the shapes now most favored by the galvanizing industry

combustion engineering; second, mechanical engineering; third, galvanizing engineering; and fourth, chemical engineering. In the early days it was not realized that success depended not upon correct application of one of these fields of engineering, but on all of them. Failure occurred because some of the engineering was right and some of it was wrong.

One of the things that has always had a strong influence on pot shape has been pot failure. A pot failure in hot-dip galvanizing is a very serious matter, especially when the pot is a big one. One operator estimated that a pot failure cost him over $50,000, which could be broken down into actual loss of changing pots, building a new furnace and heavy loss arising from stoppage in production at the highest point in the business season.

Regardless of many discouraging galvanizing pot failures, it may be said that everyone was making a sincere effort to improve things. The combustion engineering of galvanizing pots has always been one of the most difficult of industrial heating problems. Even today the problem is a long way from being solved satisfactorily, although much progress has been made in the past 20 years. Enough knowledge is now available to state definitely some of the basic facts involved in the engineering of galvanizing pots. Some ideas formerly adhered to for economy's sake are now discarded because engineering facts and data have proved the ideas to be short-sighted and false economy.

For example, the old V-shaped pot was almost a standard shape 20 years ago. It was argued that it saved overhead by employing less metal to be heated up and turned into dross.

It was also said that the V-shape gave a much greater heating area and thus gave more uniform operating conditions. Experience has shown, however, that this shape of pot piled up dross high in the bath because of the very narrow section at the bottom. When the work passed through the bath it also passed through the dross, covering the galvanized coating with dross specks, or as it was called in many plants, "sand in the coating". Moreover, since the bottom quickly filled with dross and heat applied to the bath had to go through the dross, the V-shaped pot was an abundant dross maker. A very large amount of heat was accumulated in the dross, and pots often burned through very quickly.

So the V-shaped pot was replaced slowly by the 4 ft. deep, reversed-flange type, Fig. 1. This pot has a flat bottom, and being rectangular in shape there is more room for the dross to accumulate and lay on the bottom. No heat is applied to the bottom because the pot is heated on both sides, and the bad condition of the heating of the dross is almost removed entirely. With this newer pot, the only place where the dross is heated is where it lays up against the sides. The dross may be from 6 in. to 1 ft. deep, depending on how often the pot is drossed.

Size of Pot

The size of the article to be galvanized determines the shape and size of the pot. When a new galvanizing pot is installed at least 1 ft. must be allowed on each end for the length of the part and at least 6 in. on each side for the width. For example, consider a pot for the metalware industry. These pots are rectangular in plan. The length is generally 6 to 7 ft. for pots that will coat pails, fire buckets, coal hods and sprinkling cans. In this type of work a slag flux is used on one-half the bath, while the other half is clear. The pot, therefore, must be twice the size of the work with all allowances. The width of the pail pot is generally 30 in. For tubs, which are larger, the pot must be larger in proportion. A tub pot or ashcan pot, is 7 to 8 ft. long and 42 in. wide. This leaves a little over 6 in. working space on each side of the tub, or ash can, and is a little over twice the length of the work. The depth of the pot must also be suited to the type of article. Such pots have a standard depth of 4 ft. which gives room for a few inches of lead on the bottom, and allows for an accumulation of at least a foot of dross, and still gives clearance for the work to go through without going down into the dross.

Production Influence

Production involving real tonnage also influences the shape of pots. In the case of pipe and similar articles the length of the pot is determined in about the same way as above, but a different method is used for estimating the depth. This dimension is based on the production put through the bath per hour. It can be seen that cold pipe going through the zinc takes away heat rapidly and therefore it becomes necessary to build up a reserve heat storage. This is done by making the width and the depth of the pot such that the metal in the pot will hold plenty of heat reserve over that required by the actual production going through the bath in pounds per hour.

Investment in metal will also affect the shape. For example, a pot 20 ft. long by 4 ft. deep and 3 ft. wide will hold approximately 100,000 lb. of molten zinc. At the current price of zinc this is an investment of at least $7,000. For this reason pots are sometimes made shallow to save on metal in process. One of the most peculiar-shaped pots was described recently. In order to save metal, one half the pot was made deep, and the other half was made shallow.

Not so long ago it was believed that a very small pot was more economical than a large one for hot-dip galvanizing of malleable cast-iron fittings. Modern practice has shown that it is more economical to use a larger pot, despite the objection of more money tied up in zinc, and the by-products produced from a larger bath.

In the past most hot-dip galvanizing pots were riveted. More recently many pots have been electrically welded. These fabrication processes also have influenced the shape of galvanizing pots.

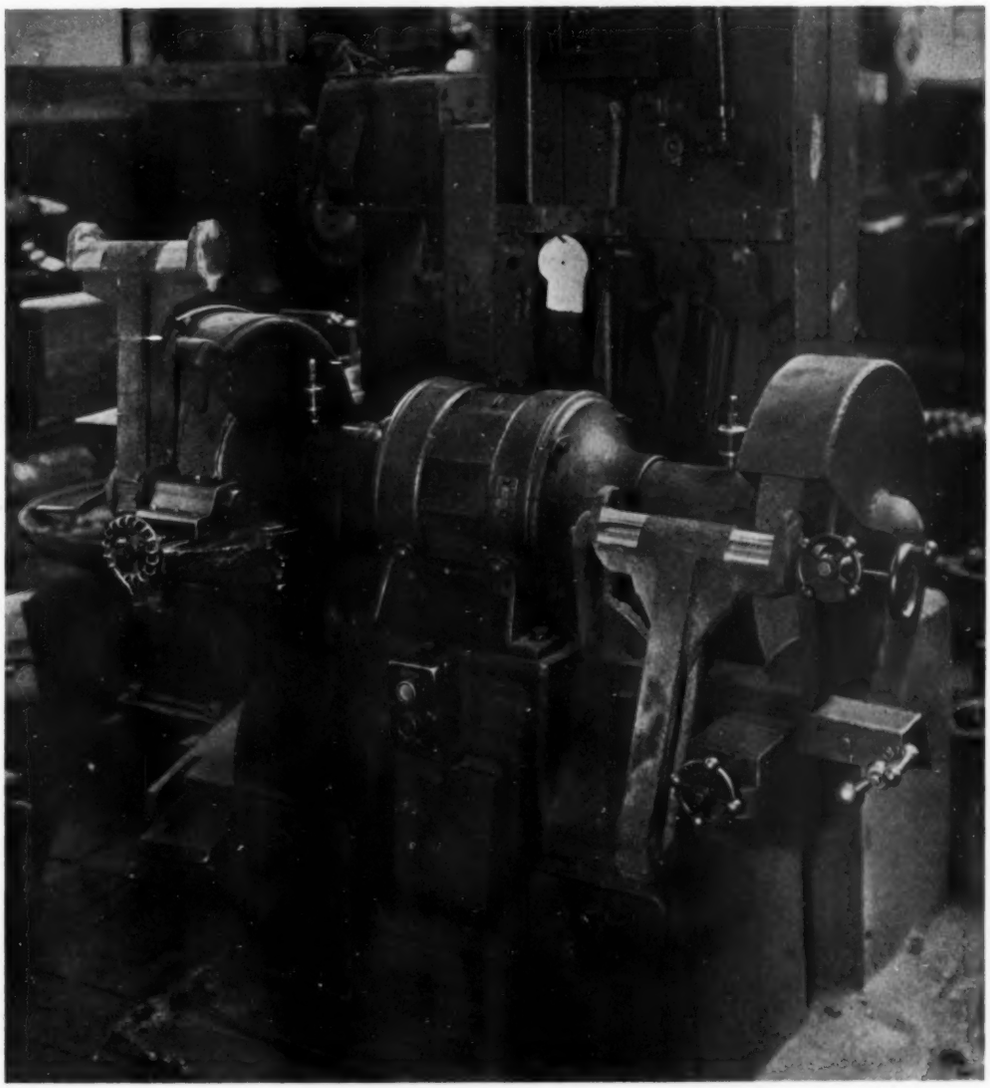
Attention is called to the fact that galvanizing pots are not heated on the bottom, but only on the two sides. Some engineers felt that better heat distribution could be obtained if the pots were heated all around, and this gave rise to the pot design known as the one-piece-body pot with the bottom either riveted in or welded to the body piece. This gave rise to another shape of pot which was almost rectangular in plan, but which had the corners very much rounded.

In the final analysis there is no standard shape of galvanizing pot, but the nearest to a standard is the reversed-flange steel pattern with firebox steel sides and flange-steel bottom and ends. The nearest to a standard depth is 4 ft. The sheet galvanizing industry has practically standardized on the square pot, and the other fields of galvanizing on the type mentioned above.

Modern functional principles of design, as applied to plant construction, allow maximum use of daylight for lighting factory interiors. The Austin Company has just completed a four-story plant at Philadelphia for Yale & Towne in which set-back columns permit installation of continuous horizontal bands of sash on three sides of the building. The sash is interrupted only at the building corners by vertical shafts of masonry. Production and assembly lines are laid out adjacent to the daylighted outer walls. Here is a view of the third floor assembly line for industrial-truck units

A Good Floor Grinder Job

FRANK C. HUDSON



The desired radius is formed at both ends of the work by utilizing the two wheels of the grinder

Special fixtures attached to a standard floor stand make it possible to grind T-columns in a railroad shop

UTILIZING a floor grinder for a machine operation is not usual shop practice. In the illustration a Hisey-Wolf grinder is being used to grind the bearing surfaces of T-columns as used in some modern railway trucks. While no close tolerances are prescribed, it is an advantage to have bearing surfaces fairly smooth and uniform.

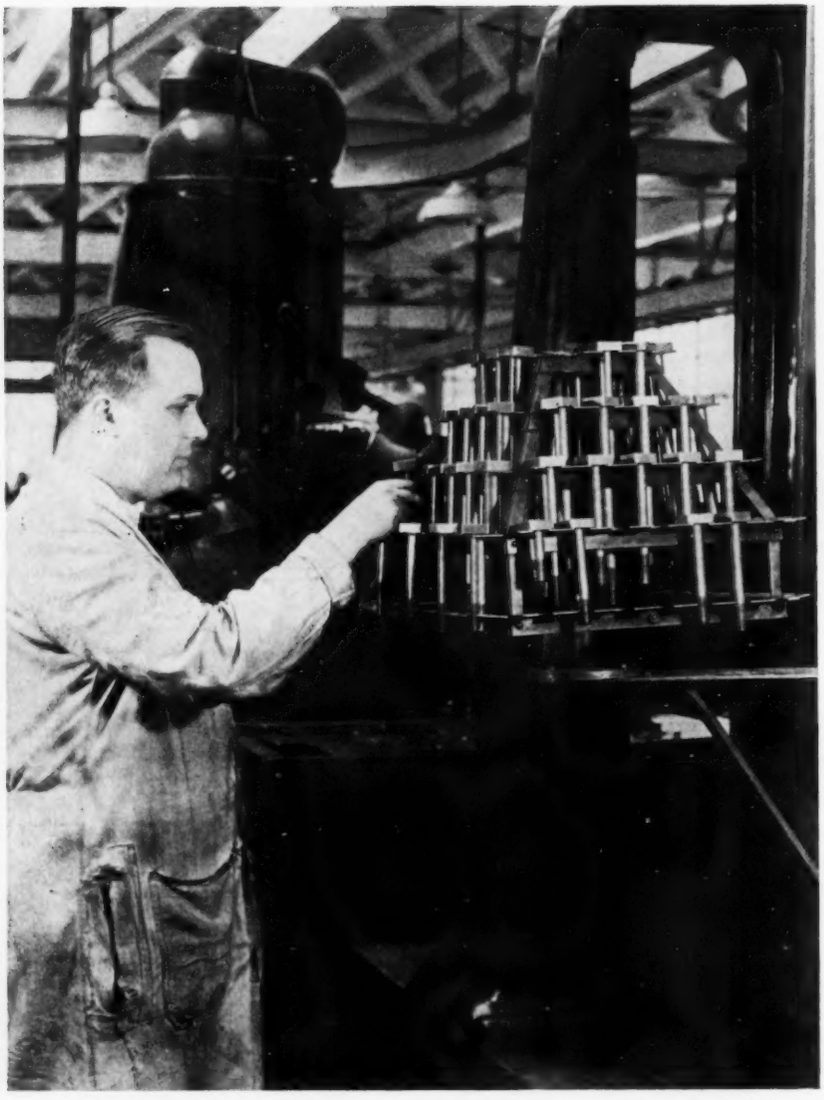
Simple fixtures hold the T-columns in both cases. The right hand fixture is made of bar steel and bent in a U-shape, having corner brackets welded in place for additional strength. It has centers for holding the work and is mounted on a slide to permit grinding both surfaces. A rack and pinion moves the carriage and the work from one position to the other. The fixture also has a screw attachment for feeding the work into the wheel. Grinding the two bearing surfaces is readily done with this set-up.

Another simple fixture for locating the opposite end of the T-column for grinding is shown in place on the other side of the grinder stand. In both operations the work is turned by hand, being fed against the wheel until the desired radius is secured. Methods of this kind show progressive thinking on the part of shop executives. This from the Roanoke Shops of the Norfolk & Western Railway.

A Job Shop That Is on the Job

II—Policies that set up a Chicago job shop on a sound basis have been discussed; this installment tells about shop management kinks that expedite prompt service to customers

HARRY BOYAR
Boyar-Shultz Corporation



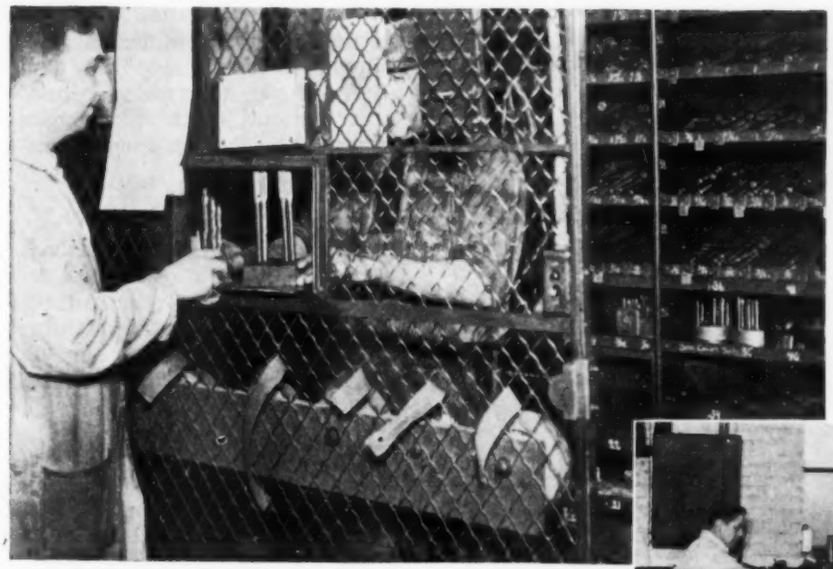
All sizes of machine bolts are conveniently racked where they are needed. Rack made of steel angles turns on center post, holds a hundred bolts

IT WILL BE recalled that we went into business in 1928 (*AM*—Vol. 82, page 228) and have followed definite, even well-known, management policies that have kept us in the black ever since, despite lean years. These policies involve using only the best and latest machine tools, frequent replacement of equipment, a sizeable inventory of tools and steel, and hiring only the best men for top wages. Being firm believers in the policy of prompt fulfillment of orders and good quality of products, we adopted certain methods to insure continuation of this policy.

Delays due to waiting for supply houses to furnish material are eliminated by carrying a stock of some 30 steels in considerable quantity. With a large supply of so many kinds of steel it is necessary to have a satisfactory method of identification from a stores' standpoint and to insure against loss of identity during early stages of production.

All bars and plates are painted their full length as soon as received. Four basic colors are used to represent the four main types of steel used in the shop. Red indicates an oil-hardening steel. Yellow is used to represent tungsten high-speed steel. White represents water-hardening steel and gold means molybdenum high-speed steel. Any other color used with these basic colors will indicate the brand of steel.

We feel that this system of identification is good because no fine shades of color differentiation are required. The primary color indicates to what general class of steel any bar belongs and is easy to remember. Quick ref-



The only time the mechanic goes to the toolroom is to secure general-type tools which do not belong with any one group of machines. He is shown here securing blocks of wood holding four reamers and a tap and drill set

All collets and equipment for bench lathes are racked at the center of the bench where they can be reached quickly

erence to the toolroom table indicates any other refinement of identification needed.

Along with our practice of carrying large supplies of steels in stock, we have found that it is a paying proposition to carry a large supply of tools and accessories for our machines. They are not stacked up in a store room but are distributed to the various machine centers.

For example, in a separate room in which are the Pratt & Whitney jig borers, lockers hold a complete set of parallel bars, cutters, end mills, reamers and arbors. There are several tools of each kind. One man is responsible for all the tools. As they become dull the tools are collected by the toolroom man who sharpens them and supplies replacements. In no case is it necessary for the mechanics to leave the machines to get tools.

Each machine group in the shop is handled the same way. The group of milling machines which is used by the tool and die makers has its own tool supply. A large locker with every sort of milling machine necessity is right in the center of the group. One of the men has charge and carries the key to the locker.

To demonstrate the thoroughness in carrying out this program; another milling machine group in the production department is also equipped with every necessary accessory and an even larger assortment of cutters, reamers and arbors.

Some years ago we began making our own machine bolts for our milling machines, lathes, planers and other tools. These bolts are made of chromium-nickel steel, heat-treated, and have a rust-resistant finish. So that the bolts would be available for instant use we made racks of steel angles welded together. Each rack will hold over a hundred bolts, 1½ to 16 in. long. Racks are supported on swinging arms in a location convenient to the various machine tables.

Both the production and tool-and-die division milling machine groups have their own complete set of accessories and cutters

A rack running down the center of a table with four bench lathes holds all the collets that will ever be required, and they are all properly numbered and sized. Successful operation of such arrangements depends on getting men who will return things to their proper places. Good mechanics and men who take pride in their work and appearance of their work place can be found. Only a little training and a very little supervision are required to keep the system in operation.

This group of new lathes in the production division has its own set of collets at hand. A locker at the extreme left holds all lathe accessories

The added expense for tools is more than offset by the reduction in number and time of "walking tours" between machine and tool-crib. There is a noticeable lack of men moving around the shop on errands connected with their jobs.

When slack periods come along, tools are made to replenish the various lockers. All sorts of tools come in this category and a wide variety is continually under way. For example, the operators of the slotters need never stop to regrind a tool to another shape. When an operator asks for a slotter tool, he receives a block of tools which includes all normal radii, V and other shapes.

The main tool crib thus serves two functions: first, it keeps the miniature toolrooms about the shop fully supplied; second, it serves as general stores for tools which are not used exclusively by any one group of machines.

Handy Groups of Tools

In the toolroom certain methods have been adopted to reduce time delays in securing the proper tools. If a ½-in. tap is requested, the mechanic receives a block in which are six tools, all of which could conceivably be used in connection with such a job: first, second and third tap, a body drill, a tap drill and a counterbore. Or if a ½-in. reamer is requested, a block with four reamers will be issued. The four reamers will include one which is 0.001 in. undersize, another 0.002 in. undersize, another 0.001 or 0.002 in. oversize and one nominal size. Small hand files of several shapes and sizes are issued in groups of twelve. In every case blocks of wood are drilled to a suitable depth to hold the tools.

Finally, to complete the picture it is necessary for the toolroom to carry a large inventory of bolts, screws, nuts and so on. These include standard, socket head and lock types. Dowel pins of every size are carried and are separated into standard-diameter and oversize groups.

Slower Grinding Needed for Titanium Carbide

CEMENTED-CARBIDE grinding practice has been developed from previous experiences with tool steel, high-speed steel or cast metals (Stellite) and is based upon the characteristics of a straight tungsten carbide. The problem of grinding tungsten carbide was practically solved with the development of a silicon-carbide wheel installed on conventional grinding equipment. But with the introduction of the titanium and tantalum carbides, difficulties in grinding have been experienced.

It is not possible to grind a cemented carbide with a titanium content above 8 per cent or a cemented carbide with a tantalum content above 12 per cent with the conventional grinding speed of 5,000 to 6,000 ft. per min. in automatic or semi-automatic grinding procedure. The thermal conductivity of these materials is much less than for tungsten carbide. Assuming a thermal conductivity of 1 for tungsten carbide, the conductivity for titanium tungsten carbide with 8 per cent titanium is 0.74 and for titanium tungsten carbide with 12 per cent titanium it is 0.047. These steel cutting carbides have lower thermal conductivity and the grinding problem is more difficult.

There are two factors which are responsible for destructive wheel action on compositions with low thermal conductivity. These are hardness (and density) of the wheel and its speed. Speed is the dominating factor. Tests have been made abroad beginning at 800 ft. per min. and it has been found necessary to reduce the grinding speed from 5,000 to 6,000 ft. per min. as commonly used, to about 2,000 ft. per min. The more conventional speed will generate heat which is not carried away and causes destructive local expansion and cracks. Even if these cracks are not openly visible, the structure is spoiled and the tip will crack later during the cutting or regrinding procedure or will continuously flake out.

Hand grinding, which is preferable in any case, can be done at the conventional speed because the tool remains in the hand of the operator and if considerable stock is to be removed, should approach the wheel with an oscillating motion to have smallest possible area of friction in contact. Recommendations of American Cutting Alloys, Inc. are as follows:

1. That machine grinding should only be applied if the form and shape of the tool absolutely require it.

2. Hand grind at conventional speeds; fixture grind with an open and porous wheel at 2,000 ft. per min. and dry grind in any case.

From remarks by G. B. Knaepper, chief engineer, American Cutting Alloys, Inc., during discussion of a paper on grinding of cemented carbide tools by Malcolm F. Judkins at the annual meeting of the American Society of Mechanical Engineers, Dec. 6, 1937.

TALKING SHOP

"Psychic Income"

Did you ever hear of "psychic income?" Neither did we until we talked recently with an official charged with the responsibility for keeping foremen "sweet" on their jobs. Psychic income won't buy coffee and cakes or clothes for Mary and little Willie or won't provide the wherewithal to finance a vacation trip to Niagara Falls. But it often is responsible for a foreman doing a good job and it is of inestimable value in improving the *esprit de*

corps of an organization. What is "psychic income?" It is simply the mental satisfaction that a man gets out of his work. When a foreman does a good job, the management gives him a figurative pat on the back. When the company does something, it takes him into its confidence. He is made to feel like more than a cog in a huge wheel. He does a better job because of the "lift" that he himself gets from it. And if more attention were given to the "psychic income" of the rank and file, there would be less discontent and fewer strikes.

Where Knowledge Frightens

There's an old saying that "ignorance is bliss." Perhaps we might reverse this by saying that "knowledge is sometimes frightening." One of our railroad friends has just had a Magnaflux apparatus put in the shop, and some of its disclosures have been disturbing, to put it mildly. They have shown incipient fractures in apparently good locomotive parts—parts that had been tested by the time honored method of whitening, and passed as perfect by the inspector.

The mere fact that one of these crack detectors has been put in a railroad shop is most encouraging. Prevention of a single wreck will save its cost many times over. Incidentally, the same shop is improving its machine equipment and its machining methods.

Court of Last Resort

Prophets have been putting the locomotive on the scrap heap for many years, but we still use a few. The same is true of the scraper as a final finish in mating surfaces. Time was when all important journal bearings were scraped, even in the early automobile engine days. Scraping in this field seems to be a lost art at present. The so-called diamond boring has now come to be the accepted practice.

When it comes to flat surfaces, however, it's a different story. We plane with a single point tool or broach in some cases. But in most instances the scraper still holds sway for a final fitting of surfaces together. The grinder is making inroads on this field but many still feel that the scraper is the court of last resort for a real fit. And this opinion is not held only among the older men whose judgment may be partly discounted as prejudice.

One good mechanic wants to use a fine abrasive powder to fit his finest sliding surfaces after scraping. But he still remembers the old argument of grains of abrasives bedding themselves in the metal and cutting after he wants it to quit. Which looks as though we could still find plenty to argue about!

Hogs, Harps and Flycutters

Some experienced mechanics fail to see the use of spending time trying to standardize the names of things used in the shops—nomenclature, if you want to go high brow. They seem to be like the dissenter who complained that Noah didn't deserve any credit for naming the animals, with the remark—"Just look at a hog—anyone would know it was a hog to look at it."

But even such a simple tool as the "flycutter" has different meanings in some shops. To most of us it means a single point cutter such as has become standard in accurate boring machines—what we sometimes call "diamond borer," though most of them use carbide tools today. In one shop the other day, however, flycutter meant a double-point cutter that cut on both sides of the bar. Then there is the swivel on the planer, which becomes a "harp" in the Cincinnati district. While names ought to be descriptive, it is even more important to have them mean the same in different parts of the country.

Saving Replacement Time

One of the advantages of standardization that pays real dividends is in using gears, bushings and other parts that can be readily replaced. It took a long time and several heartbreaking failures before standard drill bushings became a regular article of commerce. Making standard gears dates back many years, but there are

still machine designers who do not fully appreciate their value.

One candy manufacturer is reported to have had so many delays from the replacement of special gears that he took a very drastic step. He had all his machinery redesigned so that standard gears could be used. Every gear was taken from the catalog of a well known gear maker. Now replacements can be made with a minimum of delay.

Telling 'em How

An innovation adopted by one distributor of tool steels has much to commend it. Every batch of steel is accompanied by complete instructions for heat-treating that particular grade and brand. This should save money for the users. *The Editors.*

ROUND TABLE

Gift Horse

"What's up now, Al? You look as though you had been visited with all the troubles of Job, and then some. Seems to me you should be feeling rather good right now—particularly since you've landed enough business to get the shop going full time once more. You're not having labor troubles are you?"

"Well, Ed, I suppose you could call it that," Al responded. "Only they're not the kind that'll cause you much worry. Look at that!" He pointed to a new handbag beside his desk. "A token of esteem from the boys in the shop," he moaned.

"Some people get all the breaks," Ed sighed. "How did you rate that?"

"It may look like a darned nice bag to you, Ed, but it's only a bag full of trouble to me. Wish I knew what to do about it."

"Don't you like it, Al?"

"Who wouldn't, Ed? I find it hard, besides, to find words to express my thanks; however, somehow or other I can't make myself feel quite happy about it."

"You mean that you don't like the idea of the boys giving you presents when they like something you've done for them?"

"Of course I'm glad they like me well enough to want to give me something once in a while, and for the love of Mike don't breathe a word about what I've said to anyone. I wouldn't want to hurt any of the boys."

"Don't worry about that, Al; you know I'm a clam on what we talk about in here," Ed volunteered. "How come you like the bag and are glad to have it—and still wish you had never seen it?"

"Well, Ed, let's look at it this way. How can I deal justly with the men who are working for me and with the firm if I place myself in a compromising position by accepting such things as this bag?"

"Aren't you splitting hairs a little fine, Al? Shucks, you're too conscientious."

"Not a bit of it, Ed. By accepting such gifts I lose my hold as a boss; besides, once a thing like this

gets started who knows where it's going to end?"

"Why worry about that, Al? The men in the shop won't be buying gifts every time some little thing is done for them. Why not just forget it?"

"Wish I could, Ed. Things like that may be all right when the shop is running smoothly, but what will the boys be thinking when one of them has to be disciplined or work is slack and some of them have to be layed off?"

"I don't see how you can tie the two together, Al. What does that bag have to do with a furlough?"

"Didn't you ever feel hurt when your teacher gave you a poor mark after you'd been bringing her fruit? No, Ed, while I'm all for friendly relations between everyone who works here, the giving of gifts is carrying things a bit too far. Wish I could give that bag back without hurting anyone's feelings."

Should gifts to supervisors from workmen be permitted under any circumstances? What can be done to discourage gifts?

DISCUSSION

Beginner's Luck

A man who comes highly recommended is seriously handicapped, as is the case with the man in question. We expect too much from such a man and are prone to magnify his defects when we discover, to our astonishment, that he is not perfect. Personally, I believe in the warming up system; it is the first consideration that should be given a new man, no matter how well he has been spoken of by those recommending him. —G. McARDLE

It is fortunate for industry as a whole that very few executives act as did Ed in the case of Barney. Any machinist, whether toolmaker or journeyman is apt to have trouble of one kind or another when starting in a strange shop. I wonder if there is anyone so vain that he believes that he can step into new surroundings, where he is working under strange conditions with a new product and with strangers as shop-mates and supervisors, and be dead sure that he is right on the first job?

—CHARLES H. WILLEY

Ed certainly was not onto his job when he fired Barney. When a new man comes into the plant he is not accustomed to the men he is to work with and he is not familiar with the machines he has

to use. Naturally, a new man is apt to make mistakes when working under such conditions. When he becomes acclimated, he may become a valuable man. It is up to the men in the shop and to the foreman to see that the new man gets off "on the right foot."—ROGER C. DICKEY

International Paper Box Machine Company

Better or Worse

Human fallability is the cause of errors, whether it is termed carelessness, inconsistency or oversight. Results are the same. The practice of charging a workman for spoiled work will not cut down the amount of work spoiled, but it will upset the mental state of the men and will cause dissatisfaction and more spoiled work. —W. E. FISCHER

Glorified Clerk?

By all means put the foreman into the shop; let him handle machines and men. Verbal reports, if the manager can stand them, will get straight to the root of any trouble. A courageous foreman often will make the manager move faster than his own initiative would propel him. A foreman cooped up in his box writing reports becomes merely a long-distance director of operations.

—J. M. DUNBAR

Glasgow, Scotland

Daily reports from the foremen of departments are not luxuries or necessary evils, but can be made of valuable assistance in the successful management of a plant. These daily reports should represent the work accomplished in each of the departments and the remaining work to be performed. Reports should be concise and to the point. They must point out any unusual problems that come up during each day's work.

—W. A. HARRIS

Allesley, Coventry, England

It is false economy to use a high-priced shop foreman in a clerical capacity, even though it appears to save a clerk's wages. The foreman's time can be used more effectively for devising methods of increasing the quantity and improving the quality of work produced in the shop. Obviously, management should see to it that the shop foremen are not loaded down with detail work that can easily be done by a clerk or an office boy.

If there is any position in modern industry in which one man can make or mar the success of an industrial undertaking, it is that of the shop foreman. It is only fair to say that the shop foreman, notwithstanding his lowly title, is often able to use his experience, familiarity with shop operations and his understanding of men to help those who hold better positions. The foreman who is busy at clerical work usually accomplishes little. He never should be given a lot of paper work to do.

—A. EYLES

St. Albans, Hertfordshire, England

Weak Kneed?

The larger the organization, the more is the need for cooperation among its members. Lack of elasticity in rules and regulations, however, seldom give minor executives the authority to depart from a course laid down by those at the top. Results of such policies are quite noticeable to those who have had experience in smaller organizations where it is less difficult to get sanction to depart from regular procedure.

Individual initiative often is destroyed by rigid regulations. A lack of courage, self-reliance and original thinking is undoubtedly to a great extent due to the present system of delegating to a host of minor executive duties which formerly were undertaken in their entirety by the pioneers of industry.

An executive who does not have the courage to "leave the track" when to do so, in his considered opinion, would be to the advantage of his employer, is lacking in those qualities essential for success. On the other hand, the employer who would blame his employee for taking such a liberty, without himself first considering all the circumstances of the case, would show himself unfit to appreciate the qualities which induced his employee to take risks when he could have "played safe" by adhering to the rules.

In cases of emergency, no regulations should be so rigid that it is impossible to get around them. If the fullest cooperation is to be obtained, this should be provided for, with necessary safeguards against abuse. —W. L. WATERHOUSE

Horfield, Bristol, England

Where work affects more than one man or one department, cooperation is necessary. In other cases, where the foremen and their supervisors have a sound knowledge of their work, it is best to let them act according to their own judgment. Permitting one man too much power may lead to favoritism and abuse, but if the foremen are selected with care this possibility is small.

Cooperation sometimes becomes the excuse for avoiding responsibility, giving men an opportunity to leave unpleasant jobs for others Responsibility should, as far as possible, be vested in one man and not divided among several under the guise of cooperation.

—W. E. WARNER

London, N. 1, England

The "Rugged Individual" in the old-time shop was a law unto himself. Often these conditions developed outstanding leaders, with versatile ability and rare judgment. They had not only a knowledge of machining and assembly, but of all the operations from the pattern shop to the shipment of the finished product.

Times have changed and today's methods of organized production have made it impossible for any executive to be the "rugged individual" that we used to know. There is no room for him in today's set-up. It is true that they were effective in getting things done. They dominated the entire plant and often rode rough-shod over anything or anyone that stood in their way. The executive that shirks his responsibilities or lacks initiative does not last long in the modern shop. For him to insist on cooperation is not an admittance of his inefficiency, rather it is the exercise of good judgment.

—ARTHUR SILVESTER

Loyalty—An Asset

Many valuable ideals for improving the efficiency of manufacturing operations naturally ocur to the man on the job. When the workman takes an interest in the well being of his company, he will not rest until he has brought to the notice of his superiors any ideas that he may have. Loyal employees take more pride in the quality of the work and have a spirit of tolerance for the inevitable trivial annoyances that occur in every business. It is human nature to be loyal to one's employers, but the mentality of the average workman is such that, once the feeling of trust is shaken, it is almost impossible to reestablish it. Once the feeling of loyalty has been established in a few of the hands, it will gradually spread throughout the works. —RONALD L. TANDY

Newark, Nottinghamshire, England

IDEAS FROM PRACTICAL MEN

Heavy-Duty Toolpost for the Lathe

H. W. SHEPHERD

Almost every lathe operator has experienced trouble with the tool-holding devices with which many of the lighter lathes are equipped. I refer to the familiar cupped washer around the toolpost fitted with a pad on which the shank of the tool is clamped by the toolpost screw. Under the pressure of a heavy cut the pad is likely to slip, lowering the point of the tool. Also with a coarse feed and a heavy cut the tool is likely to swing around the toolpost as a center, since it is clamped by a single screw several inches back of the point where the pressure is applied. In most work the tool is set at an angle, pointing toward the headstock, and if it is swung around by pressure of the feed it will dig into the work and probably spoil it.

The ordinary toolpost can easily be modified so as to hold the tool firmly under the above conditions. A block *A* is made to fit over the upper part of the toolpost and is attached thereto by a screw fitting in the hole provided for the regular toolpost screw. The block is drilled and tapped for the two clamping screws *B* and *C*, one in front and one behind the toolpost.

If the toolpost washer has several steps of different heights, the risers should be half the width of the tool shank to the right of the center, as shown at *D*, so that pressure of the feed will keep it against them.

Method of Truing a Drafting Machine

JOHN J. TALEY

Draftsmen who use drafting machines find that the blades or scales sometimes get out of square with the lines on the drawings or with the drawing board. That condition may have been caused by slight jars of the machine against objects lying on the drawing board or by a change of the spring band of the machine.

The scales can be squared by the use of an aluminum or steel triangle, as at *A*, having a base of about 9 in. and a height of 10 in., the edges of which should be filed just enough to break the sharp corners. In the approximate center of the triangle is attached the knob *B* for convenience in handling it.

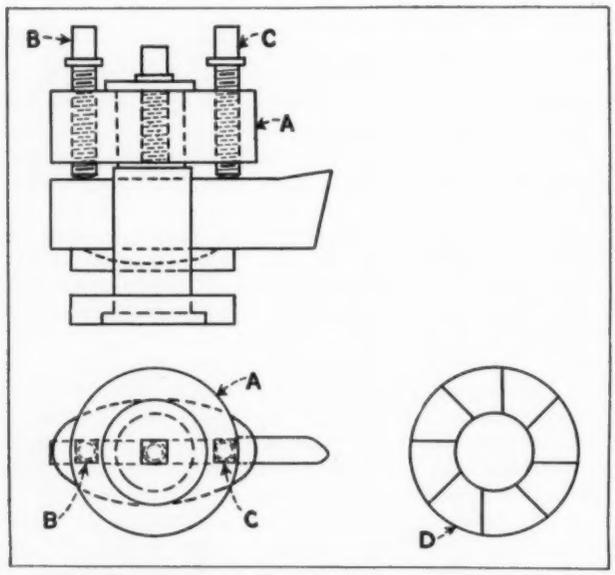
In squaring the scales, the horizontal scale is aligned with the lower edge of the drawing board and the pivot screw *C* is loosened. The base of the triangle is held firmly against the horizontal scale and the triangle is slid along to the vertical scale which is then brought into contact with its vertical side. When both scales are in full contact with the edges of the triangle, the pivot screw *C* is tightened. The dotted lines *D* show how the scales appear before being squared.

Simple Drive for a Grinder

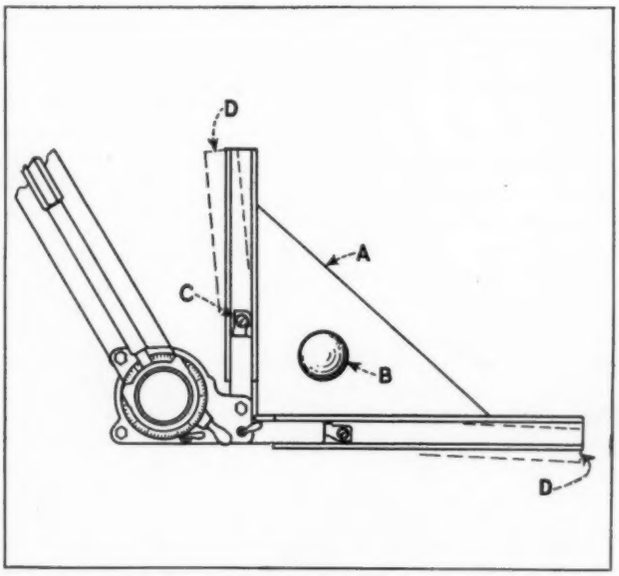
R. R. MANN

We recently had a little problem in power transmission, the solution of which may be of interest to some of your readers.

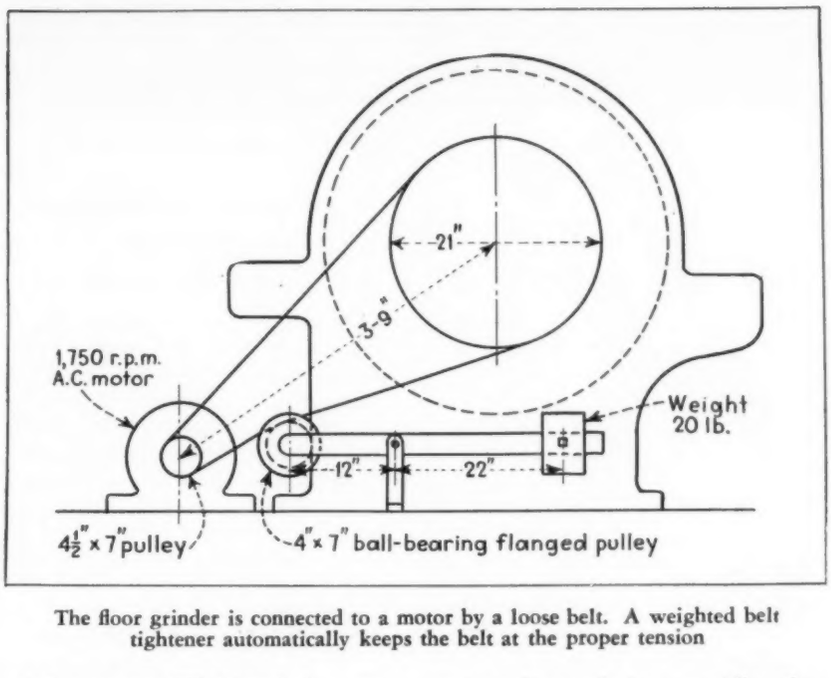
In changing over a number of machines from group drive by a d.c. motor to individual drive by a.c. motors, we had a floor grinder equipped with a 48 x 4-in. abrasive wheel to which there was no way to directly



A block attached to the upper part of the toolpost and provided with two clamping screws will hold the tool firmly under all conditions



When the scales of a drafting machine are out of square they can be trued by the use of a metal triangle in the manner described



The floor grinder is connected to a motor by a loose belt. A weighted belt tightener automatically keeps the belt at the proper tension

attach a motor. We intended to continue the machine in service, providing we could devise a satisfactory method of driving it from a 1,750-r.p.m. push-button controlled motor that we had on hand. We finally arranged to connect the machine to the motor by a loose belt, using an automatic belt tightener, as shown in the illustration.

This device has been in use for several months and gives a nice, smooth start to the wheel, bringing it up to speed in less than a minute.

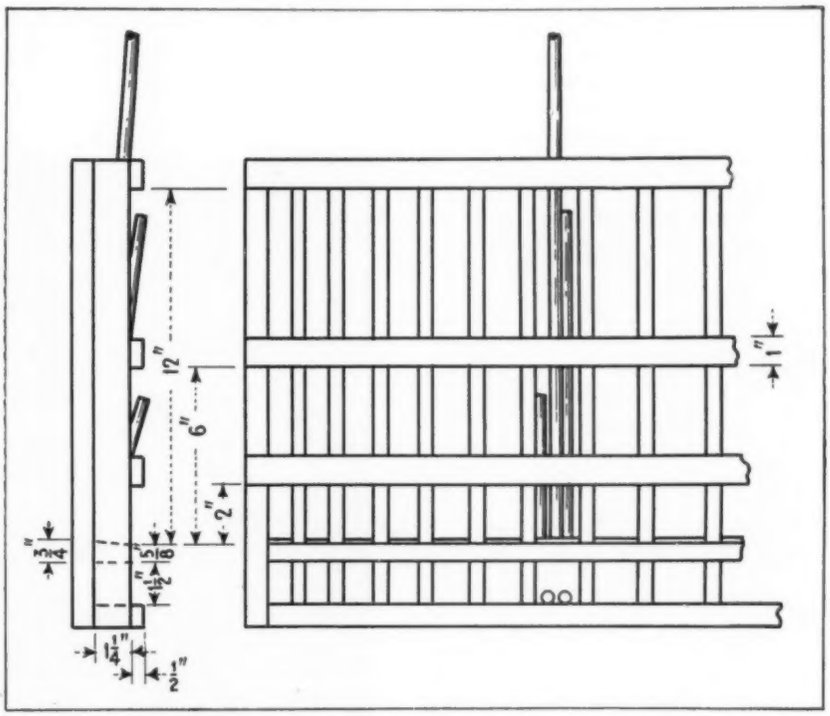
Storage Rack for Short Drill Rods

MARTIN H. BALL

Wastage of drill rods due to handling and marring by contact with other material led to the design of the rack illustrated. The method of storing permits the short lengths to be placed in front where they can easily be seen and fished out. It also keeps the different sizes in plain view and the pieces wanted for use are the only ones that need to be handled.

The height of the rack is considerably less than is usual, making it practicable to place it higher from the floor. The lower edges of the front crossbars are at even inches from the bottom of the shelf on which the rods stand, making it easy to judge the approximate length of short rods. The partitions can be spaced to suit requirements of stock of various sizes as conditions may demand. Rods of two sizes can be placed in the same compartment without causing confusion, providing they vary enough in size so that one would not be mistaken from the other. A compartment for short pieces laid horizontally is provided under each vertical compartment.

The side view shows how rods of short and medium length project outward slightly beyond the face of the rack where they can easily be seen, encouraging the use of as short lengths as will answer for the job in hand. The rack provides for all pieces however short they may be, and most of them will be used to advantage sooner or later.



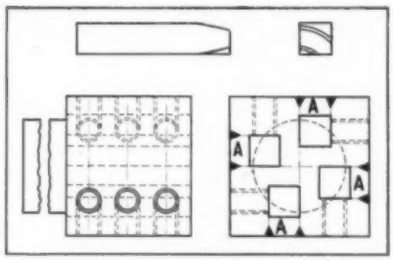
Shorter rods are placed at the front. Short pieces are laid on their sides in pigeon holes below the vertical compartments

Tool for Face Grooving

GAYLORD G. THOMPSON

The tool illustrated was made for cutting wide grooves in the end faces of idler rollers made from cold-rolled steel bars in the turret lathe. It consists of the holder, four high-speed steel toolbits and the necessary clamping screws.

In making the holder, square stock of the proper size was turned down for part of its length to form the shank and four slots of the size of the toolbits were milled in the square part, using the dividing head for accurate spacing. Pieces of square stock of the size of the toolbits were placed in the slots and the inserts *A*



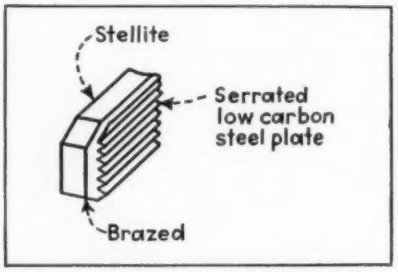
Instead of drilling, filing and broaching, the square holes were made by milling slots in the holder and welding inserts in the openings

were fitted and then welded in place. Removing the pieces of square stock left four square holes that were accurately spaced and aligned. The outer face of the holder was then finished and the holes for the clamping screws were drilled and tapped. The result was a good looking job at about half the cost of making the square holes by the old method of drilling, filing and broaching.

Serrated Backs for Stellite Blades

M. G. MONROE
Mills Novelty Company

In the usual shop it is difficult to serrate hard cutting blades such as Stellite unless special equipment is available. We solved the problem by brazing a low-carbon backing plate



A low-carbon steel plate brazed to the Stellite tool is serrated instead of attempting to serrate the Stellite itself

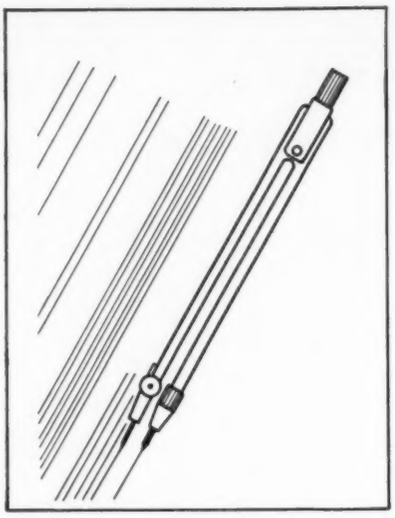
onto the blade, and this backing plate was then serrated on a grinder to suit our cutter locking holders. After several months of use the cutters were still in good condition. No failure in the braze had taken place, such as might be expected under the severe punishment which such blades take in milling cutters.

Timesaver in Drawing Die Sectioning

PAUL C. BRUHL

Drawing parallel lines for sectioning has always been a time-consuming job in the drafting room, especially in die designing where so much sectioning is done.

The illustration shows a simple method devised by the writer for drawing two parallel lines at the same time, thus cutting in half the time for sectioning. The centering needle is removed from ordinary dividers and a 0.050-in. lead, the kind used in refillable pencils, is put in its place, the regular lead remaining in the other leg. The legs are set the desired or required distance apart and the dividers are used as a pencil, thus



Dividers having a lead of the kind used in refillable pencils in place of the centering needle will enable the draftsman to draw two lines at the same time

enabling the draftsman to draw two lines in the same time that he can draw one with an ordinary pencil.

Spring Toolholder

JAMES WALKER

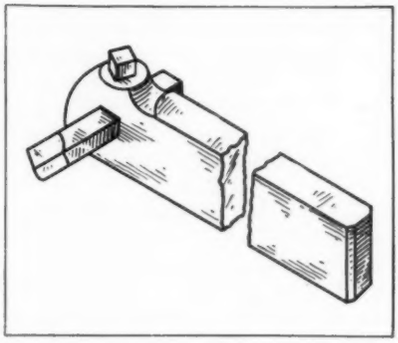
In the illustration is shown a spring toolholder that can be used in either the planer or the shaper as well as in the lathe. The toolbit is clamped in its slot in the holder by an Allen screw having a slot under the head to span the toolbit, the screw being tightened on the toolbit by a nut on the opposite side of the holder. The hardened and spring tempered bushing *A* can be used to increase the tension if desired.

Besides performing all the functions of spring tools, the outstanding feature of this tolholder is the flat bar *B* which is held in a groove in the bottom. This bar prevents torsional and sidewise movement of the toolbit by pressure of the feed.

Toolholder of Increased Usefulness

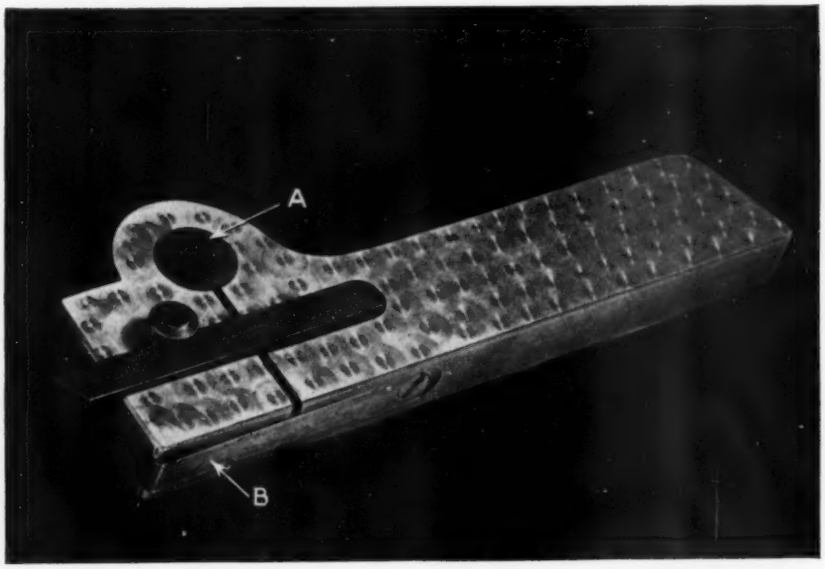
PETER L. BUDWITZ

A commercial toolholder can be made more useful by inserting a toolbit in a sidewise hole drilled and broached at a right angle to the original opening, as shown in the illustration. This little alteration makes



the toolholder readily available for boring large, shallow holes and for various recessing jobs that are typical in lathe operations. Toolbits in the additional hole have also been found convenient for doing many pesky jobs in shapers and planers.

Since most standard toolholders are heat-treated, they will have to be annealed before putting in the additional hole. The original binding screw can be used for clamping the auxiliary toolbit.



The flat bar held in a groove in the bottom of the toolholder prevents torsional and side-wise movement of the toolbit under pressure of the feed

AMERICAN MACHINIST *Reference Book Sheet*

Metallic Electrodes for Arc Welding

STANDARDS for welding electrodes have been adopted by the Electric Welding Section, National Electrical Manufacturers' Association, for the purposes of: (1) defining the various classes of metallic electrodes used in arc welding; (2) standardizing the packaging, diameters and lengths of the various types of electrodes.

For the purposes of standardization, electrodes are divided into the following nine classes: bare, thinly coated, heavily coated, high-tensile, hard surfacing, ferrous for cast iron, corrosion- and scale-resisting alloy, non-ferrous and miscellaneous. Standardization of terms will probably eliminate a large amount of confusion and misunderstanding in the trade if widely adopted. It is also helpful to know how electrodes should regularly be packaged, and in what diameters and lengths for the various kinds.

Classes of Electrodes

A. Bare Electrodes

Any mild steel electrode whose surface has not been improved for the purpose of improving the welding qualities, beyond that improvement obtained through normal wire drawing practice. Final annealed wire is included in this classification.

B. Thinly Coated Electrodes

Mild steel electrodes designed to improve the stability and performance of the arc stream, (coatings intended to change materially the physical or chemical properties of deposited materials are in Class C). Included herein are washed, sprayed, brushed, tumbled, drawn, heat dipped, or otherwise made thin coatings.

C. Heavily Covered Electrodes

Mild steel electrodes whose covering is designed to improve the physical properties of the deposited weld material. Extrusion, wrapping, dipping or combination or other means are included in this classification.

D. High Tensile Electrodes

All ferrous electrodes whose alloys are added to give tensile strength above 75,000 lb. per sq. in. in the weld metal in the "as welded" state.

E. Hard Surfacing Electrodes

All electrodes producing a weld deposit whose property is primarily to control hardness or resist wear such as 12 per cent manganese electrodes, tungsten-chromium electrodes, and high carbon steel electrodes.

F. Ferrous Electrodes for Welding Cast Iron

All ferrous electrodes principally used for the welding of cast iron.

G. Corrosion and Scale-Resisting Alloy Electrodes

All electrodes giving a weld deposit containing chromium or chromium and nickel as the principal alloying elements, the purpose of which is to obtain a weld deposit to resist corrosion at normal or at elevated temperatures. The following classifications fall in this group:

G-1 Chromium Electrodes

All electrodes giving a weld deposit containing chromium in excess of 1.75 per cent chromium, chromium being the principal alloying element. (These are the so-called straight chromium-alloy electrodes.

G-2 Chromium-Nickel Electrodes

All chromium-nickel electrodes giving a weld deposit of the corrosion and scale-resisting types.

H. Non-Ferrous Electrodes

All electrodes producing a weld deposit of essentially a single non-ferrous element or an alloy of essentially non-ferrous elements, such as copper, bronze, aluminum, nickel and copper-nickel.

I. Miscellaneous Electrodes

All electrodes of a type or for purposes not defined under Classes A to H inclusive.

Standard Diameters

The following diameters of bare and core wire shall be standard:

(a) *Class A, B, C, D and E*
$\frac{3}{32}$ in., $\frac{1}{8}$ in., $\frac{5}{32}$ in., $\frac{3}{16}$ in., $\frac{7}{32}$ in., $\frac{1}{4}$ in., $\frac{5}{16}$ in., and $\frac{3}{8}$ in.

(b) *Class F, G, H and I*
$\frac{3}{32}$ in., $\frac{1}{8}$ in., $\frac{5}{32}$ in., $\frac{3}{16}$ in., $\frac{1}{4}$ in., $\frac{5}{16}$ in., and $\frac{3}{8}$ in.

Standard Lengths

(a) The following lengths shall be standard, (except for cast electrodes):

(1) *Class A, B, C, D, E, F, H and I*
$\frac{1}{4}$ in. and larger—14 in. or 18 in. $\frac{7}{32}$ in. to $\frac{1}{8}$ in. inclusive—14 in.

(2) *Class G*
$\frac{3}{32}$ in. and smaller—not in excess of 11 in. $\frac{1}{4}$ in. and larger—not in excess of 14 in.

(b) Center grip electrodes will be within these standards if their overall length does not exceed twice the standard lengths as given above.

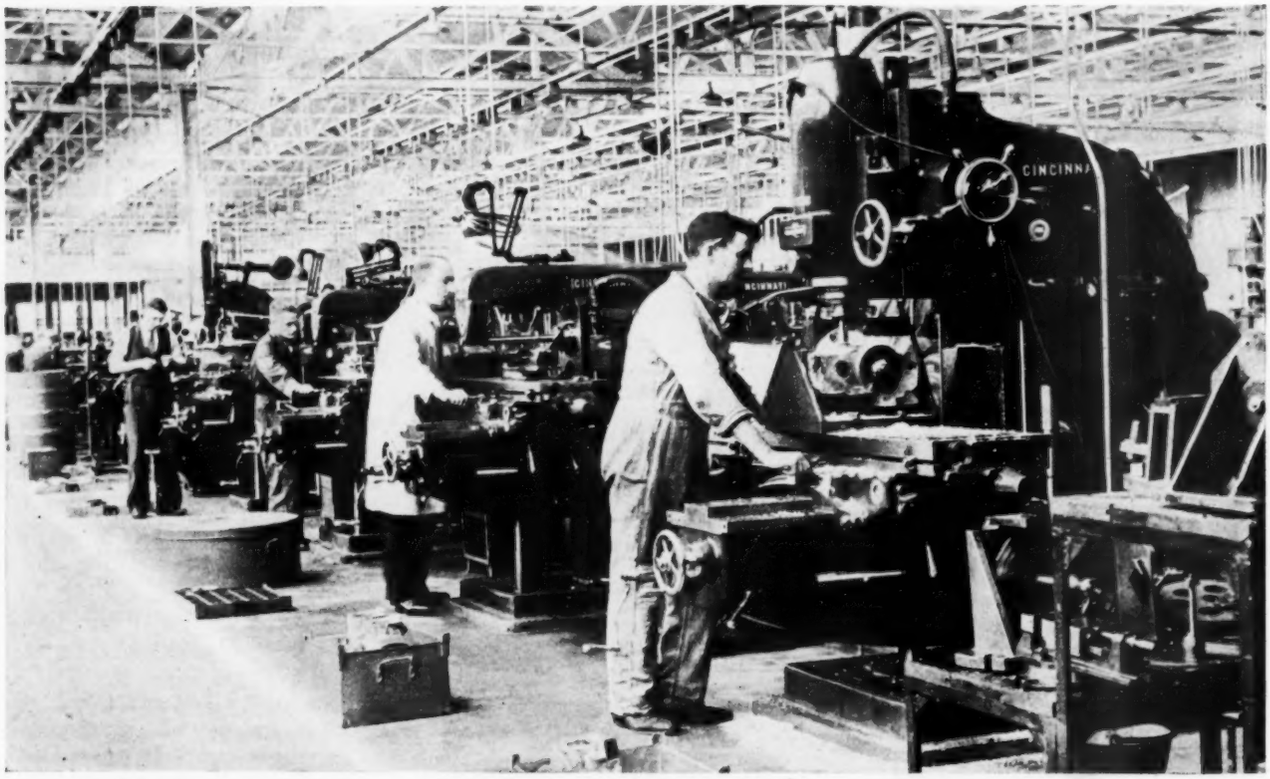
Standard Packages

Standard packages on all S. & C. electrodes shall be as follows:

(a) *Classes A, B, C, D and E* shall be 50 lb. net contents in weight excepting hard surfacing electrodes under Class E which obtain their hardness through elements other than carbon and manganese.

(b) *Classes F, G, H and I* shall be 50 lb. and/or 25 lb. net contents in weight except for those electrodes which must be packaged in smaller units on account of fragile covering.

Britain has established "shadow" plants, particularly in the aircraft industry, to provide reserve factory capacity in case of war and to speed the rearmament program. Here is an inside view of the Standard airplane engine plant at Coventry



Shadow plants, completed in surprisingly short time, are equipped with American as well as British machinery, as shown in the above photograph taken in the Humber factory where crankcase covers for airplane engines are made

Britain's Shadow Plants

Preparing for a possible clash with the dictators, Britain has created a reserve armament industry ready for production overnight in case of war

(SPECIAL BRITISH CORRESPONDENCE)

WHEN BRITAIN decided that self-preservation and the defense of the Empire made necessary a vast rearmament program, it faced a two-fold task: to re-equip its military and naval establishment as quickly as possible and to set up promptly expert facilities available for the manufacture of munitions and armaments in the event of war. The shadow plan was designed to meet the latter situation, but subsequently was considerably modified.

The shadow plan is the system under which certain companies undertook to erect, equip and manage factories to provide a reserve capacity for production of war goods in case of strife. The factories and their machinery were to be paid for by the government and would remain its property. The method of procedure was to select companies which normally did not make war materials but could do so because of their experience and because of their skilled staff of engineers and workmen. After the factories were erected, the government guaranteed enough orders in peace time to train the factory force in the new technique. While the work was going on, the companies were to continue to maintain and develop their regular commercial trade.

Nine Aircraft Plants Completed

Reserve capacity was needed for aircraft, guns, armored and transport vehicles, and munitions. However, nine out of 14 factories completed by November, 1937, were designed for aircraft manufacture. The cost of the 14 plants, according to Sir Thomas Inskip, was 8,368,000 pounds, while an additional 8,162,552 pounds had been spent by the government (up to November) for additions to existing plants. Since construction of aircraft factories has been more rapid than other parts of the program, the aircraft set-up is taken as a model in describing the essential features of the shadow plan.

Originally selected for the shadow scheme were Austin Motor Co., Ltd., Rootes Securities, Ltd., Daimler Co., Ltd., Rover Co., Ltd., Standard Motor Co., Ltd., Singer & Co., Ltd. and Wolseley Motors, Ltd. All seven of these companies were motor manufacturers. By reason of their previous experience, it was felt that they would most readily learn the principles of aircraft and airplane engine construction, while they also could draw to some extent on their own labor supply. Austin and Rootes were to build airframes (fuselages).

Seven Companies Participated

The seven companies were invited on March 25, 1936, to attend a meeting with Air Ministry officials to decide the best methods of putting the plan into effect. They were reminded of the importance of making delivery of a specified number of engines within a stipulated time and of utilizing the opportunity to educate themselves for their role in time of war. The companies agreed to work together and established a committee under Lord Austin as chairman.

Before the rearmament program began, four firms supplied airplane engines to the British Air Ministry—Bristol Areoplane Co., Ltd., Rolls Royce, Ltd., D. Napier & Sons, Ltd. and Armstrong Siddeley Motors, Ltd. In recent years the first two companies furnished the bulk of the requirements. In fact, they are the only companies which have successfully developed engines of sufficient power for modern military aircraft. Both companies were invited to participate in the shadow scheme, but Rolls Royce refused as it did not consider the remuneration enough to offset the dislocation of its regular manufacturing activities.

It was decided that the Austin Co. should produce the "Battle," a heavy bomber developed by the Fairey Aviation Co., and that Rootes Securities should build the "Blenheim," a medium bomber designed by the Bristol Aeroplane Co. Design and erection of the two factories were left to the companies subject to government approval. The Austin factory, located at Cofton Hackett near the company's Longbridge motor works, was completed in the summer of 1937 at a cost of 1,250,000 pounds. The Rootes factory, now nearing completion at Speke, Liverpool, was delayed because the site originally chosen, at Maidenhead, was strongly opposed on grounds of vulnerability and lack of available labor.

In October, 1936, Singer & Co. and Wolseley Motors, a company controlled by Lord Nuffield, withdrew from the scheme and their place was taken by the Bristol Aeroplane Co. which undertook to erect and manage a shadow factory, in addition to the work involved in instructing the remaining companies in manufacturing technique. The grounds for Lord Nuffield's withdrawal were that Wolseley Motors already had an airplane engine factory which was not being used by the Air Ministry. He offered to produce complete engines of his own design or to build American engines under license, but said that he could not agree with the other manufacturers in their opinion that each firm should make only certain component parts to be assembled into complete engines in a separate factory.

Objections Are Overruled

The Air Ministry's views were that they did not wish to increase the number of different types of engines in service and while they agreed that there were certain dangers in confining production in each factory to a few component parts, it appeared to

be the only course which ensured delivery of a certain number of units within a specified time. A further criticism made by Lord Nuffield was that the scheme to limit profits did not allow enough premium for efficiency.

The Austin Committee was charged with the preparation of plans for the new factories and once the main outlines of procedure were determined, rapid progress was made. The five factories to be managed by the motor manufacturers were located in the neighborhood of Coventry adjoining their respective motor works, while the factory of the Bristol Aeroplane Co. adjoined the company's works at Filton near Bristol. The factories were virtually completed by the summer of 1937 and the first complete engine was assembled in October.

Cost Averages £867,000

The exact cost of the factories has not yet been made public, but in November, 1936, Sir Philip Sassoon, the Under-Secretary of State for Air, said that each plant probably would cost an average of 867,000 pounds. A further shadow factory for production of variable pitch airscrews (propellers) is being erected at Lostock Hall near Bolton. This will be under the management of the de Havilland Aircraft Co. It also was decided in 1936 to duplicate in South Wales certain sections of the Billingham chemical works of Imperial Chemical Industries as part of the shadow plan, but practically no progress has yet been made in this direction. There is a shadow factory for the production of carburetors under management of H. M. Hobson Components, Ltd., while a shadow factory for production of bombs is being built.

In view of the pressure of work on the British machine tool industry, shadow factories were erected and equipped surprisingly fast. Construction started between June and September in 1936 and by October, 1937, each factory had installed over 80 per cent of the total machinery required and all plants, except the airframe plant of Rootes, were completely outfitted by the early part of 1938.

The shadow plan provides a permanent addition to the country's manufacturing capacity, at the same time getting around the difficulties associated with maintenance of idle munitions factories belonging to private firms in times when orders for armaments for replacement purposes are low. In sponsoring the shadow plan the government also was eager to avoid overburdening existing airplane engine builders with plant expansion problems at a time when they were fully occupied in producing equipment for Britain's armed forces.

Initially it was intended that just enough orders should be allotted to shadow plants to give them the necessary manufacturing experience for war times. They were then to be closed and the workmen returned to their previous employment. Actually, the factories were built so rapidly that they now are being used to produce reserve aircraft for the Royal Air Force, the aircraft industry itself having fallen behind schedule. After a year or two, if the rearmament program is not expanded, the shadow factories will probably be shut down, because the existing capacity of the airplane industry is ample to meet the government's requirements on a purely replacement basis. However, with the strength of the Royal Air Force being more than doubled, replacement needs will be far greater than formerly and the rate of obsolescence has been increased.

As previously mentioned, each company in the shadow airplane engine industry manufactures only a few component parts, which are later assembled in a central plant. The actual division of labor is as follows: Rootes Securities, blowers and drives; Daimler, crankcases, rocker gears and various pipe connections; Standard, cylinders; Rover, connecting rods, pistons and valves; Austin, crankshafts, reduction gears, certain controls and assemblies; Bristol, assembly and testing. On the airframe side, however, both the Austin and Rootes factories are self-contained and make complete airframes.

The subdivision of operations on airplane engines has been sharply criticized because it does not represent the most economical practice for precision production and because of its vulnerability. It is pointed out that if in time of war one factory were destroyed, the whole plan would collapse. The Austin Committee, however, was unanimously agreed that the present system is the only practical method of ensuring delivery of engines in the specified time. Reasons advanced by the committee were the time needed for purchasing and setting up machine tools and the strain placed on the Bristol technical staff if it were necessary to instruct all five motor firms simultaneously in each of the manufacturing processes.

Output Range To Be Widened

Criticisms of the present procedure have been admitted by the Air Ministry to be correct and it is intended that shortly the range of each factory shall be widened until each component part is made in at least three factories. Ultimately each factory will be equipped to build complete engines.

The decision that each shadow factory should produce only a small number of airplane engine parts helped to build up the labor force, since it enabled mass production methods to be used and permitted employment of a higher proportion of semi-skilled men than is customary in the industry as a whole. The Bristol Co. was called upon to furnish a nucleus of skilled labor which was augmented from the company's own works. These men were employed partly to instruct the men and partly to set up the machine tools to be operated by the semi-skilled men drawn from industry in general.

In airframe production the problem was more difficult. Because there was not the same scope for the utilization of mass production and for employment of semi-skilled labor, a higher proportion of skilled workmen had to be provided by the Bristol and Fairey companies. Even in these factories, however, by far the greater percentage of labor was recruited form outside the aircraft industry.

SHADOW PLANT HIGHLIGHTS

Factories have been built and equipped in a surprisingly short time.

* * *

Weekly incomes of workers are above those in other industries.

* * *

Plan has not adversely affected private businesses of companies involved.

* * *

Training courses were set up to relieve shortage of skilled men.

* * *

Each aircraft plant produces only a few component parts, which later are assembled at a central plant.

On account of general industrial recovery and of increased armament activities, a shortage of skilled labor was felt in England even before the shadow factories were completed. The situation was especially acute among skilled metal workers for the aircraft industry so that many aircraft firms had already established special training courses. In the early stages of the air force expansion program much "poaching" took place. The firms which had been the first to introduce training plans claimed that as soon as a man had ended his training, he was offered higher than standard wages by a competitor. It was soon realized that a continuation of

Up-to-the-minute technique is employed in the shadow plants. Here you see workers in the Standard shadow factory, part of the Rootes group at Coventry, cleaning airplane engine parts by electric process

that practice would result in undue inflation of wage rates, and an agreement to prevent further poaching was reached. On the whole, this agreement has worked well among aircraft firms, though the industry has continued to attract workmen from other industries.

The training programs have been the source of considerable labor unrest, since skilled men have objected to having to train unskilled men. At the beginning of the rearmament program, the government announced its intention of consulting the trades unions on questions affecting the training of labor, but such consultations are only starting now and the recruiting of labor has been left to the individual companies. In the aircraft industry there have been several unofficial strikes (strikes not recognized by the Amalgamated Engineering Union) on the training question, notably at the Stockport works of the Fairey Aviation Co. and the Derby works of Rolls Royce, Ltd.

Wage rates for the British engineering industries are set by negotiations between the Engineering and Allied Employers' National Federation and the Amalgamated Engineering Union. Rates are fixed by districts and all firms associated with the National Federation are pledged not to pay more than those rates. In practice, however, much of the aircraft work is done on a piece-work basis and the piece-work schedules are so designed that weekly earnings in the aircraft industry are above those in other industries.

There is no doubt that shadow factories have recruited much unskilled labor which they have trained themselves. In the Rootes factory, for example, ex-cotton operatives are employed to profile the impellor unit, usually a highly skilled job. This has been made possible by simplifying the work by attachment of suitable jigs to an Asquith profiling machine.

Rigid Government Inspection

Government control of shadow factories is on the same basis as that of the aircraft industry in general. All work is inspected by members of the aeronautical inspection department. If the firm in question is not already on the approved list of contractors to the Air Ministry, it is inspected by the aeronautical inspection department and may then be approved. In this case, A.I.D. officials are permanently attached to the factory, their job being to inspect the work at all stages of manufacture. Inspection extends to all raw materials, and even the chemical constituents of light alloys, bronzes and steels are certified before passing into production. The number of A.I.D. officials attached to a given factory varies according to the plant's size, but may be as high as 100.

The companies having shadow plants are responsible for general supervision and management of those plants. Bristol and Fairey are involved in a further capacity, that of instructing the engine companies in the technique of aircraft engine production. In the early stages, members of the engine companies' staffs were sent to the Bristol and Fairey factories for instruction, but since the completion of the shadow plants, Bristol and Fairey have sent instructors to these factories. Duties of the instructors have been to cooperate with the staffs of the engine companies and to assist them in laying out the new work and organizing production. As soon as manufacture has been satisfactorily established, these instructors will be withdrawn from these factories.

Burden on Supervisory Forces

The shadow plan does not appear to have had any appreciable adverse effect on the private business of the motor manufacturers involved. It has meant a considerable burden on the supervisory forces, however. The plan has strained the resources of the Bristol Co. which has had to provide instructors and a nucleus of skilled men for no less than five airplane engine factories and an airframe factory. Even in this case the strain was less than anticipated, critics at the beginning claiming that Bristol would not be able to carry out its duties. As a matter of fact, the Bristol Co. will derive certain advantages from its cooperation with the other companies which already have contributed a number of ideas with the purpose of speeding up and cheapening production.

All labor, materials and other costs in shadow plants are met by the Air Ministry. Remuneration of individual companies takes the form of an annual payment combined with a fixed amount per engine. As soon as sufficient experience has been gained by

a company, a basic price per unit is fixed, this price being determined by the anticipated cost. Companies then receive as a bonus a proportion of any savings made. Though the shadow plants are all engaged in building Bristol engines, the basic price is not necessarily the same as that fixed for the Bristol Co. itself. This is due to the fact that the production cost in shadow factories is lower than that of the Bristol Co. by reason of their possession of more modern equipment. Manufacturing costs are closely checked by government accountants who have constant access to companies' books.

Since the prime object of the shadow scheme was to provide a reserve capacity against the event of war, it is not possible to express a final verdict on its success. The erection of the factories and the organization of production have proceeded more smoothly and rapidly than predicted, while the dislocation of the normal activities of the aircraft firms which were responsible for instruction has been minimized. The cost of the factories is surprisingly small in relation to the total rearmament expenditure (which amounted to 195,666,900 pounds in the year ending March 31, 1937), particularly when their importance in relation to the general scheme of defense is taken into account.

Defense Precautions Taken

As to the value of the shadow scheme in wartime, the establishment of five airplane engine factories and one frame factory in the Coventry district has been strongly criticised on strategic grounds. If, however, it be accepted that the motor manufactures were the most suitable firms to undertake the scheme, the existing concentration of these firms near Coventry virtually precluded any other location. Moreover, it is true that Coventry is not in a particularly vulnerable district, and as soon as the decision was taken to erect the factories there, special defences against air attack were provided.

While it is not possible to secure details of manufacturing processes in the shadow plants, the following facts are known. In the Rootes Securities factory, interruption of the straight flow of manufacturing sequences occasioned by the necessity for secondary processes such as heat treatment and subsidiary plating operations has been minimized. The grinding section is equipped with Orcutt and Maag machines for grinding gear wheels, Gleason bevel cutters, and Cleveland gear cutters for gang milling of gear teeth. The factory has large heat treatment and plating sections, the latter being equipped for chromating, anodizing, chromium plating and coslettizing. Each factory has a standards room, where workshop and inspection gages can be compared and checked at uniform temperature. These rooms are completely closed and air-conditioned, being entered through an air lock. They are lighted by a special form of neon lighting developed by the General Electric Co. to minimize the generation of heat, and the temperature is maintained at 68 deg F.

Daimler Plant Described

Daimler, Ltd. makes crankcases, crankcase front covers, oil sumps, priming systems, air intakes, oil pipes, valve rocker gears, boost control pipes and petrol pipe connections. Its shadow factory is equipped with Lund, Ltd. and the Churchill Machine Tool Co., Ltd. The former are fitted with an optical control device operated by a polished diamond tip in continuous contact with the job. As soon as the required dimension is reached, the needle of the gage swings through a beam of light, thus energizing the system through a photo-electric cell and throwing the machine out of gear. The factory has its own hardening, sand blasting, air compressor, polishing, plating and sheet metal departments and extends over eight acres.

Standard Motor Co., Ltd. makes and assembles complete cylinder units, including barrel head, valve seats, spark plug adapters, valve guides, cylinder lugs, elbows and cylinder head rings. It has a large nitriding department, and the exterior of the cylinder is plated with tin to avoid the nitriding action. The tin is subsequently removed by machining and after assembly the whole cylinder is cadmium plated. Special equipment is used for milling the fins on the cylinder heads, but the company looks to the time when it will be possible to die cast the cylinder heads. The factory has a total floor area of 230,000 sq. ft., and a gravity roller conveyor system is in use throughout.

The Rover factory, occupying over two acres, is responsible for the manufacture of all parts for connecting rod assemblies, pistons, gudgeon pins, valves, springs, cam gears and tappet gears.

The Austin factory, which is equipped for both airplane engine and airplane production, is the largest of all the shadow factories, sprawling over 15 acres. On the engine side, the factory is equipped to produce crankshafts and reduction gears, oil conduits and controls for variable pitch airscrews. In addition it is responsible for assembling and testing half the total output of engines under the shadow scheme.

Principal equipment on the airframe side consists of large presses, the largest being a 1000-ton press which is used for stamping fuel tanks. A number of 350-ton presses are used for fuselage frames which are completed in two operations. A new vertical jig has been developed for work on the tail end of the fuselage. This enables the men to work around the fuselage at two levels, avoiding the necessity for doing the work from below that is inherent in the use of the usual horizontal jigs. When assembly and riveting are complete, the jig is collapsed and withdrawn by a block and tackle overhead.

After the tail unit has been assembled to the fore portion, the fuselage moves down the shop and passes to the tail plane jigs. It then goes to the main wing assembly jigs, where the wings are attached. On reaching the end of the shop, the machine is complete and is then towed up a ramp to the flight shed where the final tests and adjustments are made. It is then hoisted by a funicular railway to a small aerodrome with runways of 600 yards and 825 yards.

Machinery Imports Boosted

The shadow plan has been partially responsible for the greatly accelerated pace of the British machine tool industry, though it is impossible to separate shadow plant orders from those due to the rearmament program in general. It is estimated that over 80 per cent of the machinery installed in shadow factories is of British manufacture. Machine tools normally are subject to a duty of 20 per cent ad valorem, but machinery of certain classes and descriptions not at the time procurable in the United Kingdom may be imported free under license issued by the Treasury. This exemption has applied to a fair proportion of imports recently owing to the necessity for rapid delivery and to the extended delivery dates quoted by most British equipment builders. Most machinery makers have been cautious about expanding plant facilities because they cannot see how the present level of operations can be maintained after the rearmament program is completed. Today they have on hand sufficient orders to keep them fully occupied for the next two years.

NEWS OF THE INDUSTRY

Army Supply Bill Will Carry Large Orders for Metal-Working Industries

Army intends to lay in war materials for force of 400,000 men which may be expanded later to a million

BLAINE STUBBLEFIELD
McGraw-Hill Washington Bureau

WASHINGTON—Before many days the President will sign the Army's 1939 supply bill, which the House has passed and sent to the Senate. It will carry somewhere near a half billion dollars, a record since 1921. This huge expenditure for national defense is brought about by several causes. First, the President is no pacifist. He is definitely for battle, on land or sea, when necessary for the safety and rights of the nation. Second, that spectre of millions still unemployed brands the New Deal a failure till they're back at work; a lively Army-Navy armament program will help. Third, the President, himself a seagoing man, boomed the big Navy; now the Army says "me too." It's a renewal of the old American intra-mural armament race between sea and land forces. Many changes will be made in the bill before it reaches the President's desk. But beyond doubt the metal-working industry will harvest millions of dollars worth of new orders. Three of the President's recommendations, written into the bill, are especially good news to the industry. One calls for $8,800,000 of anti-aircraft material. A second calls for $6,080,000 of gages, dies and other aids to manufacture by private industry. This equipment would be bought and stored, ready for assignment to private plants in case of emergency. It does not represent in any sense a step in an educational orders policy.

A third recommendation authorizes $2,000,000 to replenish ammunition supplies which have been depleted below the safety level.

A fact that impresses both military men and the metal-working industry is that about 28 per cent of the entire military budget is chargeable to land air forces. The bill provides specifically for 476 new airplanes of all types, and parts, at a cost of some $40,000,000 in appriated cash and contractual authority. Contractual authority in lieu of cash is voted when deliveries are not expected during the fiscal year. This program will bring the total land air force up to the authorized quota, in 1940, of 2320 ships—2149 for the Air Corps and 171 for the National Guard.

The bill also provides that part of the $2,000,000 spare airplane engine fund be diverted to experimentation on better methods of airplane production. For Ordnance the bill allows $14,244,034 more than the current appropriation. In addition to special industrial machinery, the anti-aircraft augmentation, and the ammunition reserve, Ordnance gets $900,000 to begin a medium tank

Officials of the United States Steel Corp. are shown arriving at Pittsburgh on March 24 while on an inspection trip of subsidiary operations. Left to right—J. L. Perry, president, Carnegie-Illinois; E. M. Voorhies, vice-chairman, finance committee, U. S. Steel; B. F. Fairless, president, U. S. Steel; E. R. Stettinius, Jr., chairman, finance committee. U. S. Steel; M. C. Taylor, chairman, U. S. Steel, and J. C. MacDonald, assistant to chairman, U. S. Steel.

program; $912,000 for anti-tank guns; $385,367 for increased aircraft armament; $260,000 for continuation of the semi-automatic rifle program; and $600,000 for tools and machines to increase such rifle production.

Approximately $1,000,000 will be applied to replace and augment the Army's present fleet of 12,525 motor vehicles of all kinds, many of which have reached the age of uneconomical maintenance. Coast defense projects are not publishable. They include long-range guns, anti-aircraft, fire control, submarine prime equipment, searchlights, etc. To augment defense equipment the bill provides $5,193,547 to be used for the Pacific Coast, Panama Canal and Hawaii. The National Guard gets $3,000,000 for the purchase of airplanes, $500,000 for motor vehicles and $1,148,000 for anti-aircraft equipment.

The Army program for 1939 is only the beginning of bigger things. Today manpower is small, but material deficiency is even more impressive. The general staff is trying to lay in an adequate supply of critical materials for an army of 400,000. It plans next to step the land force up to near 1,000,000. The next jump will be to 1,500,000. And along with increasing volume of land force goes a constant trend to more mechanization, good news for the metal-working industry.

Western Metal Congress' Success Leads to Demand for a Bi-Yearly Show

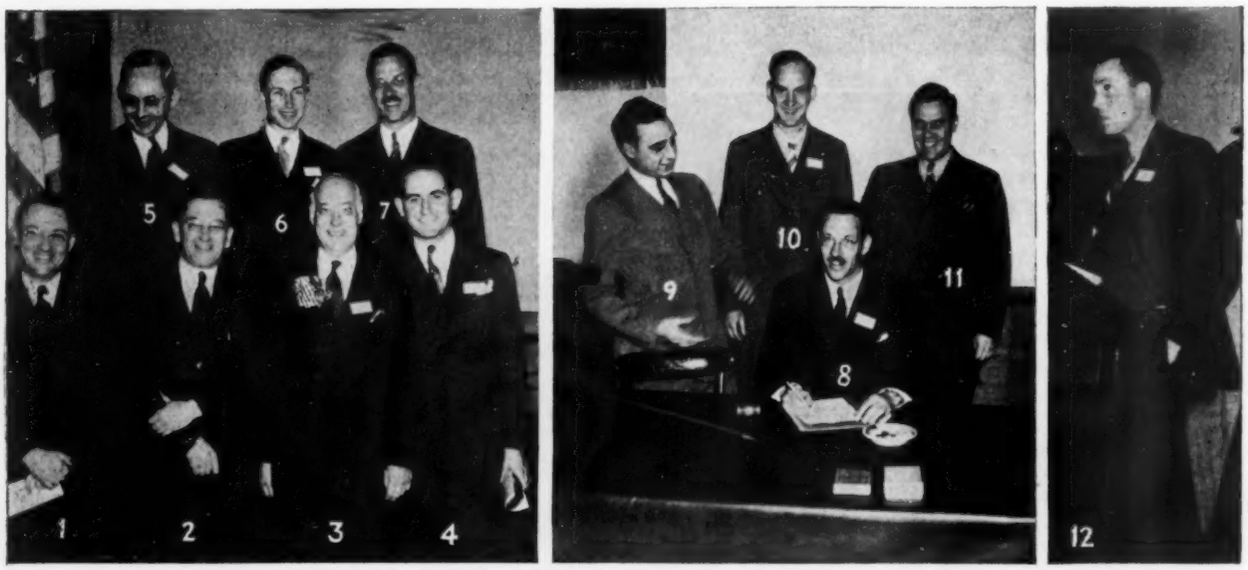
More than 4,500 persons attended the technical sessions and over 37,000 jammed the exhibit hall

LOS ANGELES—As was to be expected in a territory where petroleum production and aircraft production are the two dominant industrial activities, the Western Metal Congress and Exhibition displayed definite aeronautic and petroleum influences. Held from March 21-25, the Congress had the theme "Better Metals in Industry." Because of the aviation influence, a wide range of metals was covered, including cast, die-cast and forged alloys of aluminum and magnesium as well as those of iron and steel. Besides the aviation and petroleum industries the sessions covered mining, foundry, garage machine shop and general industries.

More than 100 speakers took part in a three-ring program, which included sessions by the American Society of Metals, the American Welding Society and the American Society of Mechanical Engineers. Attendance at these sessions totalled 4,500, of which about half were registered by the A.S.M. In line with A.S.M. policy of having a well-known authority give a series of lectures, Dr. A. Allan Bates, manager of the chemical and metallurgical department, Westinghouse Electric & Mfg. Co., gave five lectures on "Fundamentals of Ferrous Metallurgy" which were attended by more than 5,000 people.

Crowds of interested spectators jammed the exposition proper, in Pan-Pacific Auditorium, setting an attendance record for the five days and four nights of more than 37,000. Exhibits set a new high for such a show in the West, by a wide margin. Total value of exhibits on the floor would easily exceed $2,000,000, and actual sales made by exhibitors at the show were placed at $1,250,000. All exhibitors were delighted with trade and public interest. As a result of the show's success it is planned to stage a similar event in Los Angeles every two years, though no official confirmation of this could be obtained.

General conduct of the congress was under the direction of John Disario of the Columbia Steel Co., with W. H. Eisenman, secretary of the American Society for Metals, handling detail arrangements. Dr. D. S. Clark of California Institute of



Among those participating in the A.S.M. and A.S.M.E. Western Metal Congress sessions devoted to aeronautical subjects were: (1) Arthur W. Winston, metallurgist, Dow Chemical Co.; (2) A. A. Handler, manager, forgings department, Aluminum Co. of America; (3) Prof. Bradley Stoughton, dean of engineering, Lehigh University; (4) J. R. Goldstein, research engineer, Douglas Aircraft Co.; (5) Harvey A. Anderson, Western Electric Co.; (6) Dr. E. E. Sechler, California Institute of Technology; (7 and 8) Dr. Clark Millikin, also of California Tech.; (9) Richard M. Mock who gave a paper for R. K. Bernhard of Baldwin-Southwark; (10) Charles McLellan, University of Washington; (11) Charles C. Misfeldt who gave a paper for Henry E. Guerin of Douglas Aircraft; and (12) Carl de Ganahl, president of Fleetwings, Inc.

Harry W. McQuaid, **assistant chief metallurgist, Republic Steel Corp., spoke on "Machinability of Alloy Steels" at the A.S.M. machinability session**

Technology, served as program chairman for the technical sessions, and A. G. Zimo of the International Nickel Co., acted as chairman of exhibits for the exposition. Covering more than 40,000 sq. feet of floor area, the exposition was a symphony of metal in motion.

A detailed description of all the exhibits would be impracticable. Although directed primarily at the professional audience, they showed a surprising artistry of presentation which suggested the influence of nearby Hollywood. Many exhibitors, such as Republic Steel Corp., United States Steel Corp. Subsidiaries, Bethlehem Steel Co., Timken Roller Bearing Co., and others staged large and costly displays, each an exposition in itself.

As the Los Angeles show closed, officials of the American Society for Metals reported the heaviest advance registration in history for the Detroit National Metal Exposition and Congress, to be held Oct. 17-22. A feature of the national metal congress will be international participation, a strong British representation having been assured already.

Tool Engineers Charter St. Louis Chapter

DETROIT—Chartering of its 17th chapter at St. Louis has been announced by the American Society of Tool Engineers. Officers of the chapter are: chairman—E. A. Doogan, tool engineer, Huffman-Ligonier Co.; treasurer—H. P. Linders, master mechanic, Wagner Electric Corp., and secretary—H. F. Tomasek, die designer, General Metal Products Co.

Japs Relax Restrictions On Machinery Imports

Large amount of equipment will be bought in other countries

TOKYO—For the first time this year the Japanese government has issued permits for importation of 200 pieces of machinery worth 5 to 6 million yen. In addition, the government may adopt a more liberal policy in licensing small tool imports and issue permits on the basis of 1936 imports (the last which were under no restrictions).

Outstanding import applications call for machinery valued at 60 million yen. The Japanese Railway Ministry will purchase abroad tools costing one million yen because domestic firms cannot make desired deliveries. The Manshu Kosho will spend 200,000 yen for 46 machine tools, while the Showa Hikoki Kogvo Kaisha (Showa Aircraft Industry) requires machinery estimated at a million yen. The South Manchuria Railway Co. is to purchase 100 machine tools for its shops. The Mitsubishi Heavy Industries are again in the market; the new inquiries are for machinery for the Nagoya Aircraft Works.

A 15-Million Yen Affiliate

The Toyo Bearings Manufacturing Works has started promotion of a 15-million yen affiliate, the Showa Bearing Products Corp., which will build a factory at Sakasegawa near Tokyo. A new machine tool plant is being constructed in the "Riken" set-up in Maebashi City, Gumma Prefecture (Riken is backed by Mitsui capital and stands for RI-kagaku KEN-kyusho, Physico-Chemical Research Institute and affiliated industrial enterprises). With funds of 8 million yen, the new enterprise proposes to make lathes as well as boring and grinding machines. The Riken Piston Ring Co. already is turning out 50 lathes, 10 grinders and 10 millers a month. Its subsidiary in Niigata Prefecture builds 20 lathes and 10 boring machines monthly.

The Ishii Shoji (Trading) Kaisha has applied for authority to establish a 2-million yen company to manufacture universal grinders and plain millers. The Ikegai Iron Works is preparing to erect a new machine tool plant at Kawasaki, near Tokyo. The Toyo Kohan (Oriental Steel Plate) Co. has confirmed a decision to organize a 15-million yen machine tool company. All of these projects have been stimulated by the government's intention to place the machine tool industry under a license system which provides for exemption of machinery companies with certain qualifications from income tax, business profit tax and other taxes. It also allows companies to float their debentures and to increase their capital beyond limits named in the existing Commercial Code.

SKF and Japs Agree

Japan's foreign trade relations under the prevailing wartime economy were believed to have entered a new phase when Bjorn Prytz, president of the Svenska Kugellagerfabriken Aktiebolaget (SKF), recently concluded an arrangement with Japanese government authorities under which SKF will be able to maintain its sales volume in Japan without drawing on the meager foreign exchange resources with which Japan finances her curtailed imports. Although details of the arrangement have not been announced, it seems that SKF has agreed to write the total volume of 1938 deliveries to credit account, on an understanding that redemption of this credit will be facilitated "as circumstances allow."

Japanese industries bought bearings in 1937 totaling 19,000,000 yen. of which 14,000,000 yen were SKF products. Under the import-export adjustment regulations, only a fraction of that sizeable volume would have been imported this year.

The SKF president was also instrumental in making arrangements for a barter agreement—machines for beans—between the Swedish and Manchukuo governments. Since similar agreements were made between Germany and Manchukuo, one of which involved a £2,000,000 credit by the Otto Wolf concern, Sweden has been losing much steel and machinery business to Germany. Through the present arrangements Sweden hopes to restore its former position in Far Eastern markets. Mr. Prytz visited both Japan and the United States en route to his post as Swedish Minister to England.

DETROIT LETTER

What to do about 1939 models is most important automotive problem . . . Makers have newly-designed small cars "on ice" . . . Companies slow in releasing tooling programs . . . Ford resumes junking plan . . . Chrysler renews union contract for year

DETROIT—With the 1938 model year being shaved down to a total production of less than 3,000,000 units, the big question in automotive circles is what to do about '39 cars. It's a tough question to answer. Whether to go ahead with original plans and spend a lot of money revamping cars from bumper to bumper, or to stand pat on what is being built today, or to cheapen cars and cut prices, or to doll them up and stick to current price levels —that is the problem which is giving the industry a first-class headache.

What most manufacturers are trying to do is to stand pat and do as little as possible for as long as possible. Of course, some things have had to be done, because heavy tool and die work can't be put off indefinitely. Chrysler is to use remote shift control on its cars and Packard will do the same. Plymouth and Dodge will return to coil spring front-wheel suspension, while two General Motors divisions are considering changes in front-end design. For all of these jobs, tooling has been released. But where several weeks ago it looked as if the flood of tool and die orders was breaking down the dam, the flow now has suddenly stopped.

The Big Three have low-priced small cars laid out for introduction "when, as and if." The 105-inch wheelbase Ford is reported the closest to production. It is built around the 60 engine and is said to be designed to provide this engine with a car it can pull around with a performance comparable with that of the Ford 85. The four-cylinder Plymouth is understood to have been released by the engineering department and has been laid out on paper from a tooling standpoint but beyond that nothing of importance has been done.

Going up the line a bit in price, the battle of the cylinders is starting to rage again. Report has it, for instance, that one company now building a six and an eight will wind up with two sixes and that another with a similar double line will drop the eight. In the former case, if the plan is adopted, the second six would be a lighter lower-priced model. But no decision on either move has been arrived at; meanwhile production divisions are sitting tight.

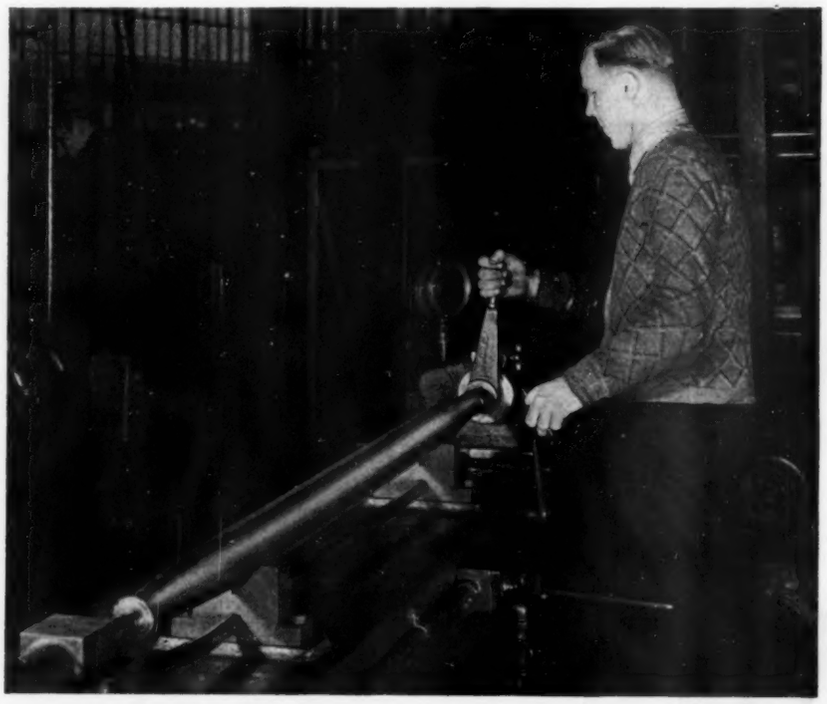
Take the matter of Chrysler's line of engines. Three new engines originally were scheduled for 1939. They haven't been dropped, but apparently nothing has been done about getting the needed equipment. Nash and Studebaker seem to be about the only companies which have gone ahead with tooling programs. Hudson has been slow in releasing orders on changes definitely decided upon.

Caught in January with dealer financing difficulties, Graham is once more in production on passenger cars. Just what will happen is uncertain, since it is estimated that Graham must build around 10,000 passenger cars and 6,000 Sears-Roebuck tractors to come out ahead each year. Nevertheless the 600 cars for which parts have been released to the company by vendors does put the company back into action. Tractor output is proceeding at 25 to 30 units daily.

The first annual passenger car activity meeting of the S.A.E. proved interesting. It's been a long time since so many important engineers from car factories took part in S.A.E. goings-on. From the discussion one would gather that the time has not come for automatic transmissions, introduction of the remote shift control having put off the automatic transmission by a year or two. S.A.E. President C. W. Spicer perhaps best summed up the attitude of the engineers at the meeting when he remarked to *American Machinist* that if the meeting was any criterion, the industry was about to see the beginning of a new era in automotive development and that the future should see some vast changes in automotive design.

Parts Plants Cut Wages

There have been a number of wage reductions in automotive parts



***Torsion Test*—Lincoln-Zephyr propeller shafts are subjected to a torque load of 11,000 in.-lb. on this hydraulic machine and must resume their original position within 1/16 in. measured on a 3-in. radius**

factories lately. Most wage cuts, however, have not affected minimum rates of hourly pay and therefore have not come into the category of questions which U.A.W. plant contracts cover. U.A.W. international offices, in fact, disclaim knowledge of such reductions, pointing out that unless they are in violation of contract provisions they are "matters for locals to decide."

Nevertheless, labor violence broke out in Detroit last week when the Federal Screw Works decided to cut wages to competitive levels. Workers accepted the reduction to keep the factory open, but the U.A.W. threw picket lines around the plant. Federal retaliated by cancelling the U.A.W. contract. Clashes between pickets and workers had resulted by midweek in injuries to more than 100. The U.A.W. fight was led by Walter Reuther, arch opponent of Homer Martin. The U.A.W. is using the Federal Screw Works incident largely as a test case to find out where it will come out when it refuses to accept wage reductions and is countered with a contract cancellation.

Office-Help Unions

Chrysler has renewed its agreement with the U.A.W. for one year, the agreement being subject to ratification by the union locals not later than April 18. A number of other union contracts, particularly in parts factories, are coming up for renewal now. A development in labor has been the recommendation of the executive board of the Society of Designing Engineers that it affiliate with the C.I.O. At present this society is the only union of importance representing office workers. Manufacturers are perturbed over possibilities of large scale unionization of office help. Salary reductions, lay-offs without pay and placing of office workers on an hourly or day rate have opened the doors to union organizers in some plants.

Some weeks ago Ford resumed junking of old cars on a small scale through its Dearborn branch, buying cars from dealers at $12.50 each, carting them to Dearborn and breaking them up at the Rouge plant. So far the plan has been confined to a 300-mile radius of Detroit, which is considered the longest distance cars can be hauled economically to the Rouge plant. At first dealers supplied quite a number of jallopies, but the supply is reported to have dwindled lately.

Exports of Machinery During February, 1938

	February 1938	January 1938	February 1937
Electrical machinery and apparatus	$7,694,880	$7,787,058	$8,002,742
Power generating machinery except automotive and electric	1,359,301	3,529,424	1,096,333
Construction and conveying machinery	1,832,824	1,934,184	1,244,848
Mining, well and pumping machinery	4,674,442	4,597,388	3,587,507
Power-driven, metal-working machinery	9,459,830	5,968,604	4,061,919
Other metal-working machinery	353,865	297,761	308,228
Textile machinery	755,445	1,004,746	621,263

Exports of Metal-Working Machinery During February, 1938

	February 1938	January 1938	February 1937
Engine lathes	$850,553	601,088	146,661
Turret lathes	690,923	414,747	200,090
Other lathes	287,521	276,880	87,274
Vertical boring mills and chucking machines	190,190	55,326	147,938
Thread cutting and automatic screw machines	513,032	291,171	204,103
Knee and column type milling machines	419,336	447,422	242,861
Other milling machines	775,607	318,557	291,384
Gear-cutting machines	309,043	128,085	313,436
Vertical drilling machines	193,960	30,820	69,751
Radial drilling machines	161,730	48,295	18,685
Other drilling machines	156,169	116,404	110,790
Planers and shapers	127,313	25,101	101,840
Surface grinding machines	199,631	105,288	106,208
External cylindrical grinding machines	605,488	119,915	61,422
Internal grinding machines	965,647	237,360	176,746
Tool grinding, cutter grinding, and universal grinding machines	340,035	186,241	114,621
Other metal grinding machines	240,510	188,251	131,357
Sheet and plate metal grinding machines	425,561	386,725	521,314
Forging machinery	356,247	268,687	62,055
Rolling mill machinery	488,020	1,061,003	261,205
Foundry and molding equipment	104,472	148,459	101,891
Other power-driven metal-working machinery and parts	458,842	512,679	590,287

Other Metal-Working Machinery

	February 1938	January 1938	February 1937
Pneumatic portable tools	$161,118	$88,648	$85,102
Portable and hand and foot operated metal-working machines and parts	91,448	92,183	87,112
Chucks for machine tools	16,249	19,452	28,112
Milling cutters, machine operated threading dies and taps and similar machine operated metal cutting tools	42,494	48,323	55,146
Other metal-working machine tools	42,556	49,155	52,320

Machine Tool Dealers to Meet in Dearborn

The Associated Machine Tool Dealers of America have announced through their president A. G. Bryant of the Bryant Machinery & Engineering Co., that the spring meeting will be held at the Dearborn Inn, Dearborn, Mich., on May 23-24. Usually the dealers hold their convention at a resort hotel, but this year the decision to meet in the Detroit vicinity was based on a desire to reflect in the program the outstanding examples in the application of machine tools so typical of the plants in that area. John Sauer, Jr., of the Peninsular Machinery Co., Detroit, and vice-president of the association, is directing the activities of the various committeemen in Detroit.

Apologies

By mistake the name Harry Boyar was used in connection with the portrait cut on page 214a, No. 6. The cut actually shows Walter F. Wagner, master mechanic of the Lincoln Motor Car Co., and new president of the American Society of Tool Engineers.

MEETINGS

AMERICAN GEAR MANUFACTURERS ASSOCIATION. Twenty-second annual meeting, April 25-27. General Brock Hotel, Niagara Falls, Canada. J. C. McQUISTON, manager-secretary, Penn-Lincoln Hotel, Wilkinsburg, Pa.

AMERICAN ELECTRO PLATERS' SOCIETY. 1938 convention, June 13-17. Hotel Schroeder, Milwaukee. W. J. R. KENNEDY, executive secretary, 90 Maynard St., Springfield, Mass.

ASSOCIATIAON OF IRON & STEEL ENGINEERS. Annual spring conference, April 28-29. Lord Baltimore Hotel, Baltimore, Md. Association headquarters, 1010 Empire Bldg., Pittsburgh.

WELDING CONFERENCE. Tri-state conference (Western Pennsylvania, Eastern Ohio, West Virginia) sponsored by the Engineers Society of Western Pennsylvania and the Pittsburgh Section, American Welding Society, April 29. William Penn Hotel, Pittsburgh.

WATCHING WASHINGTON

Congressional proposal to reverse government's patent policy draws vigorous protests from industrial groups . . . No action likely to be taken, however, at this session . . . . Inventors and small manufacturers are actively opposed to bill

McGRAW-HILL WASHINGTON BUREAU
(Paul Wooton, Chief)

WASHINGTON—" . . . . To promote the progress of science and useful arts, by securing for limited times to authors and inventors the exclusive right to their respective writings and discoveries"

That is the eighth power granted to Congress by the Constitution of the United States. It's the basic patent law of the land. It is a monopoly authorized by the government in payment and as reward for development or discovery of valuable writings, devices, compounds, ideas. It is the principle on which is based nearly all of the technological and mechanical progress of the past few years.

Now come certain law-makers, in support of the Administration in its drive against monopoly, and propose in bills before Congress that the patent policy of the government be in effect reversed. For they say that patent monopolies are now doing more damage to the people than they are doing good.

It seems probable at this time that no action will be taken on the patent proposals in this session of Congress. The anti-monopoly drive of the Administration may roll over it and bury it. Or, the drive may collapse, in which case nothing further would be done. More probably, the session will close with patent legislation trailing behind in the rush. But it will bear watching.

Here's what seems to be happening. Bob Jackson, solicitor general, is heading the Preident's anti-monopoly campaign. The proposed patent reform is part of that campaign. The opposition to patent reform says that Mr. Jackson is pulling the wool over many an unsuspecting eye. The hearings recently closed on the Hill were staged, they say, to place the opposition's information and opinion on the records. With that nice lot of data and the present three bills for framework, Mr. Jackson, they believe, will proceed to write a bill of his own. And it might be a scorcher.

These are the Administration's arguments for proposed patent reform law: (1) The public is the rightful claimant of the creative works of the individual in this democratic land. The patentee has no right to withhold an invention which might contribute to the welfare and progress of the people; (2) Mr. Jackson says that no legal defense of monopolies should be permitted under the patent laws. In other words, the Patent Bureau is now creating and abetting monopolies while the Department of Justice is warring against them; (3) Large corporations, some holding thousands of patents, a majority of them dormant, constitute a menace to technological progress. These corporations have no more right to withhold these creative works from the public pool of knowledge than has the inventor.

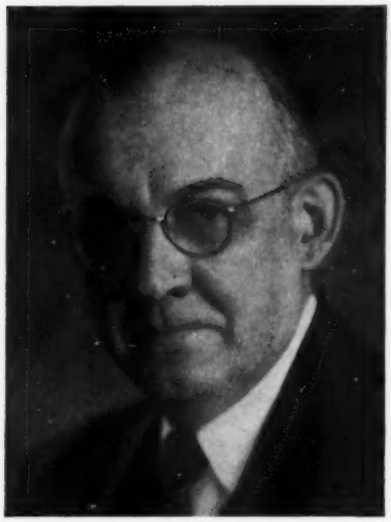
Proponents of the patent reform bills say, further, that corporations and other patent owners often put inventions on ice because new developments would obsolete not only expensive tooling and plant facilities for the old model or device, but would also render large stocks of manufactures in trade channels unattractive and unsaleable.

Opposition to the bills is almost universal among witnesses from business and industry. Inventors and small manufacturers whose business depends largely upon one or a few patents are most concerned. Most witnesses contend that compulsory licensing would greatly curtail the inventor's chance of getting financial backing, because prospective earnings would be much less. Several witnesses showed how their companies could not have been developed under such laws as are proposed. It was said the bills, if enacted, would increase unemployment, increase monopoly by large companies and encourage piracy by small companies. Removal of the profit motive would discourage the inventive and creative arts and make this a backward country. Witnesses said that patent pooling and resulting evils are both greatly overemphasized. Some stated that patents should be more definitely written and illustrated for general knowledge in industry, and that more publicity should be given them.

Mr. McFarlane has modified his bill as follows: "At any time after the expiration of five years from date of issuance, where satisfactory evidence submitted shows that a patent is not being used or that the domestic supply is insufficient or that unfair prices or trade practices prevail, any person may file with the Commissioner an application for a license under said patent and the license may be granted after a hearing."

INDUSTRIAL BANK

A tremendous volume of new plant and equipment orders is counted on by Chairman Jesse Jones of the RFC and other Administration officials if the industrial loan bill, now being rushed through Congress under the Administration whip and spur, is passed. It is one of the few proposals to aid business recovery which seems to appeal both to Congress and the White House. Indirectly it is an outgrowth of the action of SEC in imposing regulations and possible penalties on new security flotations. Chairman W. O. Douglas has been worried for some time about the difficulty confronting small corporations wishing to borrow money for new equipment and plant additions. He finally sold the President on the industrial bank idea, and Congress is willing to trust Jesse Jones to administer it. The new act will remove all limits from the time which loans can run. The present RFC law, as amended, limits such loans to maturity on or before February 1, 1945. The idea will be to require some local participation in the loan, preferably from a local bank. so as to have a watchdog for the government's money on the ground.



R. T. ROWLES

W. H. WIEWEL

H. J. WATT

PERSONALS

The appointment of three assistant general managers of sales, the opening of a new district sales office in Baltimore, together with several promotions and new appointments in the corporation's district sales offices, effective April 1st, were announced today by LEWIS M. PARSONS, vice-president and general manager of sales of the Jones & Laughlin Steel Corp., Pittsburgh.

The three assistant general managers of sales are R. T. ROWLES, W. H. WIEWEL, and H. J. WATT; the two former having general supervision over products sales departments and the latter over Eastern district sales offices.

Mr. Rowles will supervise the general activities of the hot-rolled, cold-finished, wire products, and warehouse sales departments. Mr. Rowles started with J & L. in 1912. In 1925 he was appointed manager of hot-rolled sales.

Mr. Wiewel will supervise the general activities of by-products and pig iron, sheets and strip, tinplate, and tubular products sales departments. He came to J & L in 1935 as manager of sales of tubular products. He entered the steel business in 1910 with the Cambria Steel Co.

Mr. Watt will have charge of New York City and the East, with general supervision over district sales offices in Boston, New York, Philadelphia, Atlanta and the new district sales office in Baltimore. Mr. Watt has been district sales manager in New York since 1935. He entered the steel business in 1912 in the Philadelphia office of the Carnegie Steel Co. and came to J & L in 1925.

GEORGE A. BEE is the new president and general manager of the Palmer-Bee Co., Detroit, manufacturer of power transmission and materials handling equipment. He succeeds WM. E. BEE, president of the company since its founding in 1902. J. E. MCBRIDE remains as vice-president. The company recently opened an engineering and sales office at 1228 Starke Bldg., Louisville, Ky., in charge of N. S. KNIGHT.

DAVID O. THOMAS, general manager of the Saginaw Malleable Iron Division, General Motors Corp., has relinquished his duties to become vice-president of the Bendix Aviation Corp., South Bend. WILLIAM H. DOERFNER works manager of Saginaw, succeeds Mr. Thomas as general manager.

JOHN J. O'BRIEN was re-elected president of the South Bend Lathe Works at the annual meeting. RUSSELL E. FRUSHOUR is vice-president, FRANK E. ERHARDT is treasurer, and HAROLD A. SMITH is secretary. These men with JAMES C. AMES, JOHN W. CAVANAUGH and ARTHUR W. WATELY constitute the board of directors.

CHARLES LUCIUS ALLEN, chairman of the board, Norton Co., and one of the founders, was honored on his 80th birthday by having a medal struck in commemoration of his long service to the company and to industry. Mr. Allen was first associated with F. B. Norton, who in 1873 invented and began the manufacture of the first Norton emery wheel. When Norton Co. was formed in 1885 Mr. Allen became general manager and has since continuously been one of its executive officers.

BRIG. GEN. HERMAN W. SCHULL, assistant chief of ordnance, will retire on May 31.

MILLARD ROMAINE, in charge of the service department, Cincinnati Milling Machine Co., for several years, has been appointed sales manager. He will be assisted by SWAN BERGSTROM, who has been manager of the Detroit office. HOWARD POPE is the new manager of the service department, and FRANK GERTISER becomes Detroit office manager.

CHARLES E. WILSON, executive vice-president, and PHILIP D. REED, assistant to the president, General Electric Co., have been elected directors to fill existing vacancies on the board.

A. C. DANEKIND, chairman of the factory equipment and practice committee, General Electric Co., has been elected a director of the Locke Insulator Co.

HENRY E. FRICK has been appointed chief of construction and inspection section, The United States Maritime Commission.

J. W. WAGONER, formerly general manager, Salem Engineering Co., maker of industrial furnaces, has been named vice-presndent in charge of all operations.

J. W. WAGONER

E. A. TANNER

EARL A. TANNER, executive vice-president, Milcor Steel Co., has been elected president, to succeed LOUIS KUEN, who is now chairman.

ARTHUR E. THORNTON, formerly vice-president, was elected president of the Skinner Chuck Co., New Britain, Conn., at the annual meeting on March 18. New directors elected are: Paul K. Rogers, Jr., and Kenneth H. Walther. Mr. Thornton succeeded the late Paul K. Rogers. Other officers are: vice president, James N. Skinner; secretary, Kenneth H. Walther; treasurer, P. K. Rogers, Jr.; assistant secretary, Albert A. North.

Mr. Thornton has spent the major portion of his business life with Skinner Chuck in both sales and production, followed by executive experience. He was made vice-president early in 1936, and is now president. Before his present connection, Mr. Thorton spent several years with the Stanley Works and the Russel & Erwin Division, American Hardware Corp.

JOHN A. STEPHENS has been appointed director of industrial relations, United States Steel Corp. of Delaware, Pittsburgh. Mr. Stephens was previously manager of industrial relations, Chicago district, Carnegie-Illinois Steel Co.

H. L. ROGERS, a director, Beldon Mfg. Co., cable manufacturer, Chicago, was elected vice-chairman of the company at a recent meeting.

E. C. KIEKHAEFER has been appointed chief engineer of the Stearns Magnetic Mfg. Co., formerly Magnetic Mfg. Co., Milwaukee, Wis. Mr. Kiekhaefer started with the Stearns organization as a draftsman and subsequently moved up to the position of superintendent. His new position calls for supervision of research and development work.

GEORGE W. FLEMING, formerly president of the Fleming Machine Co., Bridgeport, Conn., which was later sold to the Black & Decker Mfg. Co., Towson, Md., is president of the recently organized George W. Fleming Manufacturing Co., which will occupy a wing in the Lewis & Scott plant at West and West Main Streets, Plantsville, Conn. The company is to make mechanical tools and equipment for the automotive and aviation industries. A small force will be employed at the start.

WALLACE D. WALKER was elected president of Talon, Inc., Meadville, Pa., at the annual meeting to succeed his father COL. LEWIS WALKER, who died in January. The younger Mr. Walker has been senior executive officer of the company.

OBITUARIES

OTTO J. GROEHN, for years a leader in the automatic field, died March 23 in Detroit at age of 49 after a long period of illness. Prior to his retirement in 1935 he had served three companies: The Briscoe Mfg. Co. where he served his apprenticeship, and later, the Clayton & Lambert Mfg. Co. and Hudson Motor Car Co.

Mr. Groehn developed the metal stamping division of Clayton & Lambert. When Hudson Motors purchased that company's stamping plant Mr. Groehn joined the automobile company. He supervised the construction and building of the Hudson body plant and its organization. After six years he returned to Clayton & Lambert as vice-president and general manager. Prior to his retirement in 1935 he again returned to Hudson as manager of the body plant.

JEREMIAH BINGHAM, who formed the Acklin Stamping Co. and the Bingham Stamping Co. years ago, and who later organized the Toledo Stamping & Engineering Co., of which he was president and treasurer, died March 29.

WILLIAM H. BOTTEN, 73, president of the Owen Bucket Co., Cleveland, O., died March 27 at his home in Shaker Heights, O., following a month's illness.

WILLIAM L. CLOUSE, 79, chief engineer and a director of the National Machinery Co., Tiffin, Ohio, died recently in Biloxi, Miss., a victim of ptomaine poisoning.

THOMAS J. USHER, vice-president, Russell & Erwin Hardware Mfg. Co., died March 25 in Chicago at the age of 75. He had been with the company for 59 years.

GILBERT E. HALL, formerly secretary and treasurer of the Herbrand Corp., drop forge concern, Fremont, Ohio, died March 21.

STANLEY M. HUNT, production manager of the Union Manufacturing Co., New Britain, Conn., died March 15 of a heart ailment. Mr. Hunt began with the Union company 30 years ago.

M. J. MILMOE, vice-president, F. B. Redington Co., manufacturer of packaging and other marchinery, Chicago. died March 22 at the age of 67.

LOGAN WOOD, brother of Gar Wood, died in San Francisco of pneumonia on March 28. Mr. Wood, who was head of Gar Wood Industries, Detroit, contracted a cold while visiting the California flood areas.

BUSINESS ITEMS

A four-story building 333x60 ft. is to be erected by Norton Co., Worcester, Mass., to replace Plant One, 53 years old, and the old office building. The structure will cost $263,000. This is the second step in a renovation and replacement program.

A new factory and general offices that will cost approximately $500,000 will be constructed by the Carboloy Co., Inc., Detroit, manufacturers of cemented carbide tools and dies. The new plant will be located on a 40-acre tract on the north side of 8-Mile Road and will be ready for occupancy this Fall. It is designed to accommodate the entire manufacturing facilities of Carboloy plants at Cleveland, Stamford and Detroit. The three buildings will cover an area of 138,000 sq. ft. of which manufacturing plant will cover an area of about 100,000 sq. ft.

Westinghouse Electric & Mfg. Co., will soon start construction of Manufacturing and warehouse facilities at its East Springfield, Mass., works. This program is partly to take care of the large amount of business, especially air conditioning, that seems certain in connection with activities in new types of housing and partly to accommodate certain manufacturing operations which will be transferred from the Chicopee Falls (Mass.) Works. It was recently announced that all radio operations at the latter works will be transferred to a plant at Baltimore. The new Springfield plant will have approximately 100,000 sq. ft. of floor space and the total operation may involve an expenditure of $1,250,000. A warehouse will also be constructed.

Ferracute Machine Co., Bridgeton, N. J., press builders, has appointed the Bryant Machinery Co., 400 West Madison St., Chicago, as exclusive dealer in the Chicago territory.

Electrol Inc., oil burner manufacturer, has purchased the plant, factory and land which it has occupied for several years, at 934 Main Ave., Clifton, N. J.

Monarch Steel Co., Indianapolis, has given a license to the Fitzsimons Co., Youngstown, to sell special grades of Monarch steels. These special grades include special low carbon, free-machining, case-hardening steel known as Speed Case X-1515, and Speed Treat X-1535, and Speed Treat X-1545.

National Auto Parts Co., 11th & Harney Sts., Omaha, Nebr., has purchased the 5-story building across the street and will install a complete machine shop for re-building motors and auto parts. DAVID B. COHN is sole owner.

The Vitek Mfg. Corp., 122 No. 11th St., Omaha, Nebr., has been organized to manufacture metal stools and chairs as well as dies and jigs. CHARLES VITEK is president and general manager, and C. O. POTTER is secretary.

Atwood Vacuum Machine Co., Rockford, Ill., has purchased the former Sterlite property in Auburn, Ind., and machinery is being moved there.

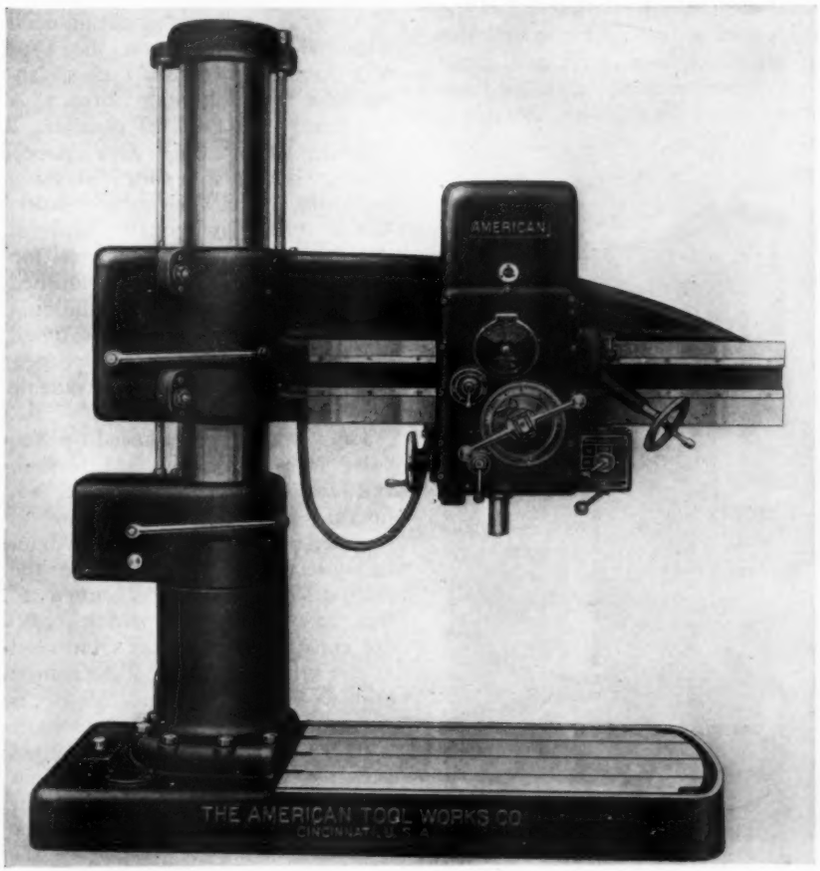
SHOP EQUIPMENT NEWS

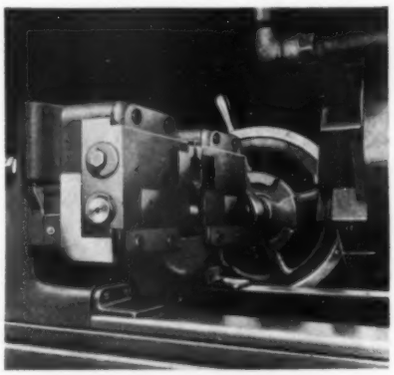
American "Super Hole Wizard" 11-In. Column Radial Drills

Built solely with 11-in. diameter columns and available with 3, 4, 5 and 6 ft. arms, the "Super Hole Wizard" radial drills announced by American Tool Works Co., Cincinnati, Ohio, have a 3 hp. built-in, shell-type ball bearing a.c. driving motor mounted directly on the head. This motor, through a conveniently located control lever, provides almost instantaneous start, stop and reverse for the spindle.

Economical drilling and tapping capacity is said to be approximately 1¼ in. diameter in cast iron and ¾ in. in steel. Spindle speeds in geometrical progression are provided to cover a standard range of 70 to 1500 r.p.m. in 9 steps. By the use of pick-off gears, this range may be changed to suit a variety of requirements. For example, a range of 100 to 2150 r.p.m. or 140 to 3,000 r.p.m. can be provided. These speed ranges are based upon the use of a 60-cycle a.c. motor. Use of motors of different characteristics will vary these ranges. Spindle reverse required for tapping is accomplished by reversing the motor.

Four rates of geared power feed are provided, including 0.004, 0.007, 0.012 and 0.020 in. per revolution of the spindle. All power feeds are produced by a sliding gear feed unit in which the gears are hardened and ground. It is automatically oiled by the pump circulating system of the head. All feeds are direct reading, the position of the dial indicating the feed in use. The improved automatic trip for the feed operates up to 10-in. at one setting. This is the full travel of the spindle. A safety stop is provided for tripping the feed at the extreme travel of the spindle. (1)





Landis Floating Carriage Front

Designed for application to "Landmaco" threading machine, a combined floating carriage front and hammer-blow handwheel is offered by Landis Machine Co., Inc., Waynesboro, Pa. This carriage front is a combination floating unit which compensates automatically for any misalignment of the work with the die head, and a special vise jaw operating handwheel which delivers a hammer-like blow to effect the gripping or releasing of the work with a minimum expenditure of effort. The carriage front consists of a vise so mounted on a series of three plates as to provide both a horizontal and a vertical floating action. Mounting is such that the vise maintains a centralized position except when forced off center by misalignment between the die head and the work. Rear plate, which is bolted direct to the carriage, is provided with screws which permit adjusting the entire unit either horizontally or vertically in relation to the center of rotation.

Used in conjunction with the

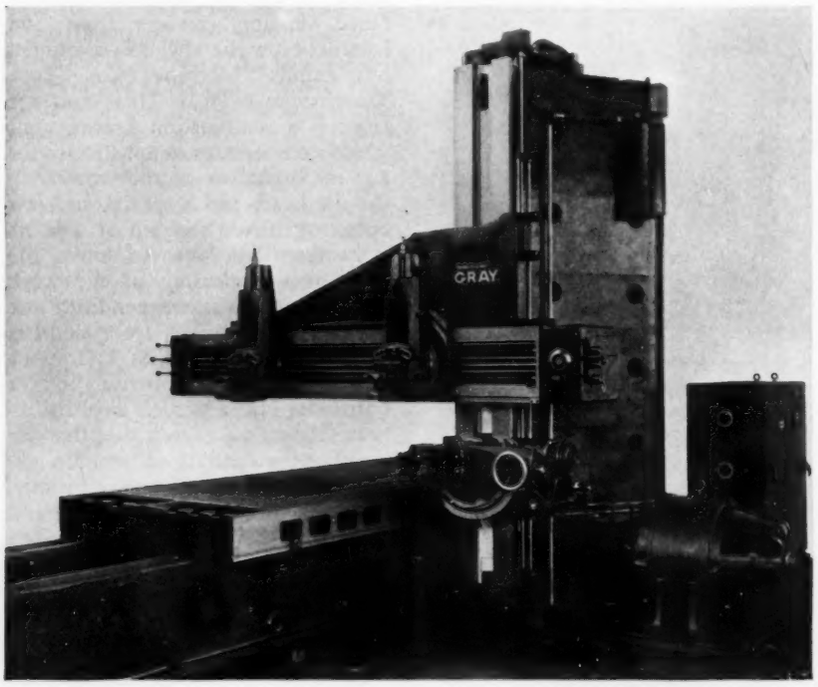
floating carriage front, but also applicable to standard carriage fronts, the hammer-blow handwheel is of the flywheel type and is free to rotate in an arc of 45 deg. on the vise screw. Two lugs, which are designed to act as hammers, are cast into the hub of the handwheel. A knocker arm, keyed to the vise screw adjacent to the handwheel, extends out between the hammers. When the handwheel is spun or rotated quickly, a sharp blow is delivered by the hammers on the knocker arm and, since the full flywheel effect of the handwheel is obtained, the work is gripped or released without exertion by the operator. (2)

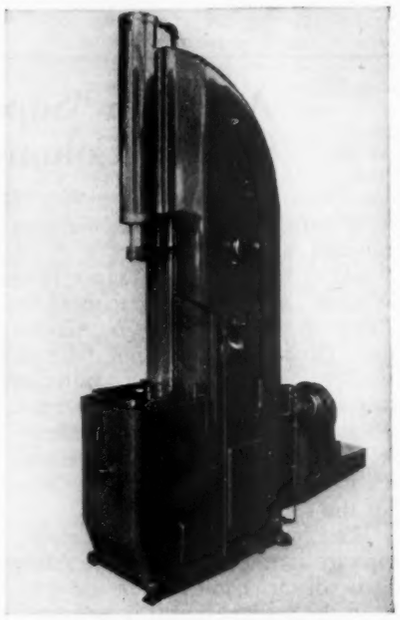
Gray "Maximum Service" Planers

Available in openside and double housing types, the "Maximum Service" planers announced by The G. A. Gray Co., 3611 Woodburn Ave., Cincinnati, Ohio, feature an improved control which makes it possible to engage or disengage the feed or to rapid traverse the heads in either direction by the movement of a single lever. Heads do not coast after rapid traversing, thus permitting the operator to place his heads by power practically to a line. Operating levers are located not only at both ends of the rail, but also at each head, so that the operator has control right at the tool point. Feed and rapid traverse are so interconnected that it is impossible to engage both the feed and rapid traverse of any one head at the same time. One head can be rapid traversed while the other is feeding.

As the control lever not only engages the mechanical drive mechanism, but also starts the motor, a supplementary pendant switch station is eliminated. This also makes the control safer, since it is impossible to leave a lever in a rapid traverse position and so accidently rapid traverse the wrong head. A manually-operated, precision tool-point locator can be furnished for the rail heads. This locator makes it possible to move the saddle or slide by hand at the head itself, instead of being forced to go to the end of the rail. On machines of any size, this feature is of importance, since it eliminates the need for a helper operating the crank on the end of the rail when precision setting of the tool is necessary.

Feed dial and control knob for setting the amount of the feed has been moved from the end of the rail to the front face of the rail. This position is said to be more convenient for the operator and puts the dial in the best light. Entire graduated surface of the dial is exposed and can be seen from any operating position. All feed and rapid traverse parts on the end of the rail are in a dust-tight case and run in oil. Side-head feed and rapid traverse is operated by a single directional lever located on the head. When power in-and-out feed and rapid traverse is furnished, this same directional lever actuates the slide. Extended saddles on all heads provide an additional long-leverage bolt circle, stiffening the harps and making it possible to use two extra clamping bolts. (3)





American Type V-2 Hydraulic Press

Having a work table built integral with the vertical column, the Type V-2 vertical hydraulic press, announced by American Broach & Machine Co., Div. of Sundstrand Machine Tool Co., Ann Arbor, Mich., is suitable for pressing, broaching and assembly work. Work table is square and is equipped with a removable steel top plate which is accurately finished for the application of work-holding fixtures for internal and external broaching as well as assembly operations. These presses are available in 6 and 12 ton units.

One four-way balanced piston valve is used for the ram control, and an automatic safety valve, adjustable for maximum pressure, is supplied with each press. Hydraulic system tank is located in the machine column and is closed so that dust or foreign particles cannot enter. Pump unit is submerged in the oil tank, where it is assured of positive lubrication. Motor is direct connected to the pump shaft.

Ram movement is controlled either by hand lever or by foot pedal. Either permits the operator to advance the ram slowly or

rapidly. Ram can be inched by varying the pressure. Automatic stops are provided and can be set for stopping the machine at any predetermined point within the machine stroke. Maximum stroke of each size press is 26 in., and maximum space between rest plate on table and end of ram is 29 in. Depth of throat from center of ram is 9½ in. The 6 ton press requires a 7½ hp. motor and has a downward ram speed of 28 ft. per min. This press weighs approximately 3,350 lb. without motor. The 12-ton press requires a 15 hp. motor and weighs, without motor, 3,550 lb. It has a ram down speed of 24 ft. per min. **(4)**

Bonney Model B-18 Cutting Plier

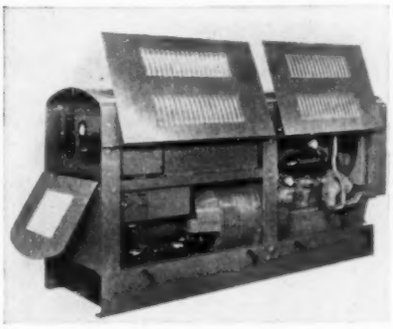
Heavy-duty diagonal cutting plier No. B-18, offered by Bonney Forge & Tool Works, Allentown, Pa., is heat-treated throughout its entire length. The long cutting edges of this drop-forged tool are ground and are claimed to withstand hard service. Over-all length is 7 in. **(5)**

H&G Style TMM No. 101 Die Head

Designed to cut taper pipe threads on automatic screw machines, where the die head rotates, the H & G Style TMM self-opening die head offered by The Eastern Machine Screw Corp., 20 Barclay St., New Haven, Conn., is caused to function by a yoke or fork on the machine. The No. 101 head shown is 2⅞ in. in diameter and is suitable for ⅛, ¼ and ⅜ in. diameter pipe. Chaser inserts are caused to recede at a definite rate, so that the taper is controlled. This principle also is claimed to eliminate marks on the threads. **(6)**

Binks Extension Paint Spray Guns

Extension arms offered by Binks Mfg. Co., 3114-26 Carroll Ave., Chicago, Ill., permit the use of standard Thor No. 7 or No. 2 Spray Guns for painting ceilings and upper walls while standing on the floor. The two brass tubes of these extension units fit into the air and material connections of the guns. Extensions are available in 6, 8 or 10 ft. lengths. (7)



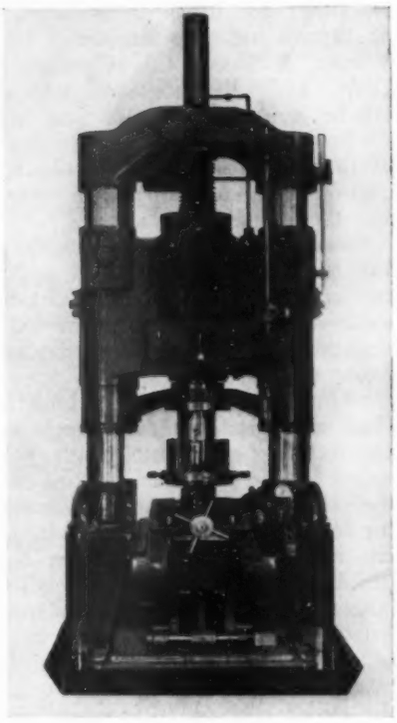
Lincoln Diesel Arc Welder

Maximum efficiency and service economy are claimed for the diesel-engine driven arc welders announced by Lincoln Electric Co., Cleveland, Ohio. A diesel engine claimed to compare favorably with gasoline engines has been adopted.

Arc welding generator used on the machine shown is the 300-amp. "Shield-Arc S.A.E." unit equipped with dual-continuous control. Features claimed for this generator include continuous voltage control, continuous current control, wide range, independent excitation, high capacity, cool operation and high efficiency. Main welding generator is used to start the engine. **(8)**

Stamets Coupling Tapping Machine

Two ground cylindrical columns support the upper structure of the oil-field pipe coupling tapping machine announced by William K. Stamets, 4026 Jenkins Arcade Bldg., Pittsburgh, Pa. These columns also serve as ways on which the head travels. Head has rapid traverse in both directions



and feed for tapping is obtained by means of an accurately ground lead screw having a course thread. Lead screw is located directly in line with the spindle.

Machine is provided with a free-floating chuck for holding the large couplings, which previously have been bored and faced. In chucking, the finished face of the coupling is placed in the machine on a surface plate, which is normal to the center line of the spindle. The chuck then is advanced by means of an air cylinder until the coupling is approximately in line with the tap. As the tap enters, the coupling is free to float into alignment. After one end of the coupling is tapped, the chuck retreats and the coupling is ejected and reversed in the chuck. Once the coupling is chucked, operation of the machine is automatic.

It is claimed that accuracy of lead in the tapped coupling can be maintained with an error not exceeding

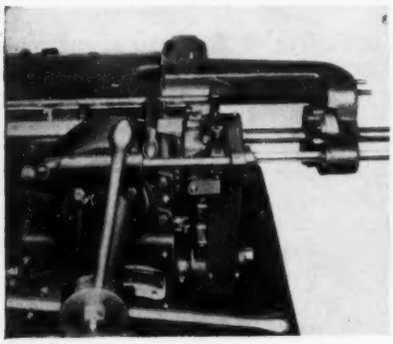
0.001 in. per in. A lead compensator has been developed to insure accuracy of lead. The machine also can be furnished with a floating chuck for holding the coupling on the finished ends only, instead of on the outside diameter. **(9)**

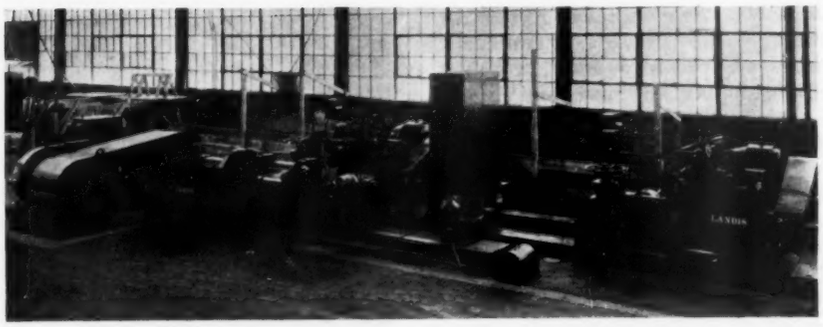
W. & S. Turret Threading Attachment

An attachment for using the hexagon turret of standard ram-type turret lathes for the accurate cutting of threads has been announced by Warner & Swasey Co., Cleveland, Ohio. The entire attachment, which can be used for the leading-on of die heads and taps or for the cutting of threads by single point tools, is controlled by one operating lever and the regular stop screws.

Control lever first engages the half nuts with the leader then, with further motion, engages the single tooth clutch at the bottom of the gear box. This causes the leader to rotate and the turret slide to move according to the pitch of the leader. Half nuts are engaged through a positively actuated cam, with no springs. The gear box attached to the saddle, transmits the rotation of the feed shaft up to the leader in a one-to-one speed ratio. Range of threads with standard head and gear box is 4 to 32 threads per in. in any lengths up to the full effective stroke of the turret slide. No positive positioning of die head or tap with the leader position is necessary, as in the case of short leaders.

Automatic trip-off of the attachment is accomplished in the same manner as any other hexagon turret operation by the regular stop roll of the turret slide. The control lever acts as an interlock to prevent the accidental engagement of the longitudinal feed when threading, or the engagement of the threading leader when the longitudinal feed is being used. It is located to the left of the apron, where it is most convenient to to the operator. The attachment can be fitted to any No. 3, 4, or 5 ram-type turret lathe. **(10)**





Landis Dual Carriage Grinder

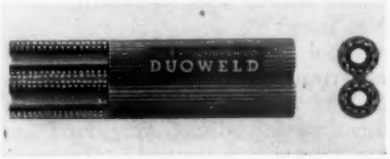
Rear bed section of this improved Type 30 dual wheel-carriage roll grinder offered by Landis Tool Co., Waynesboro, Pa., has extra length so that two standard wheel carriages may be mounted. Either carriage will grind a roll the full capacity of the machine without interfering with the second carriage, which always is out of the way at one end of the bed or the other. Capacity of this machine is 36 x 168 in. Use of a machine of this type makes it unnecessary to move the roll from one machine to another and eliminates the need for changing wheels.

Design is such that the finishing wheel head tracks with accuracy so as to follow the form produced on the roll by the semi-finishing head when grinding crowned or concaved rolls. An improved work drive has been included in this machine. This consists of a work drive motor mounted on a base at the left-hand end of the machine, where it is direct connected to a speed reducing unit. From this unit, the drive is through a silent chain to the end of the headstock spindle.

This grinder weighs approximately 185,000 lb., including all electrical equipment. Fifteen electric motors, having a total of 96 1/2 hp. are used. All motors for complete operation may be controlled from the wheel carriage being used. Wheel carriage motors are interlocked in such a manner that when one is operating the other cannot run. A jog switch at the front of the headstock enables the operator to examine the roll from the front of the machine. **(11)**

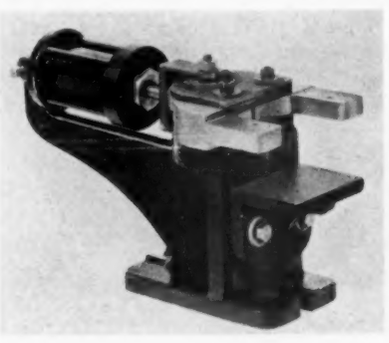
Goodrich Duoweld Oxy-Acetylene Hose

The B. F. Goodrich Co., Akron, Ohio, has announced the "Duoweld" oxy-acetylene hose for cutting and welding applications. This hose consists of two strands of ¼-in. two-braid hose, with corrugated cover, which are molded together as a single unit. The cover on one strand is red, while the other is green. This color distinction is adopted as an aid to the operator in identifying the acetylene from the oxygen line. Dual construction is claimed to prevent the two lengths of hose from becoming tangled, kinking, or snagging on surrounding objects. Hose is offered in 12½, 25 and 50 ft. lengths. **(12)**



Knu-Vise Model AKV-138 Air-Operated Vise

An air-operated, knuckle-action vise, Model AKV-138, announced by Knu-Vise Products Co., 6430 Cass Ave., Detroit, Mich., develops more than 1,000 lb. pressure at the center of the jaws when the air line is carrying a pressure of 65 lb. per sq. in. Maximum width between the two jaws is 3 in., but special jaws can be made to suit individual requirements. Length of standard jaw from face of housing to tip is 2 in. Maximum movement between open and locked position is ¾ in. Over-all height of the unit is 6½ in., and the width is 5¼ in. Total length is 12 in. **(13)**



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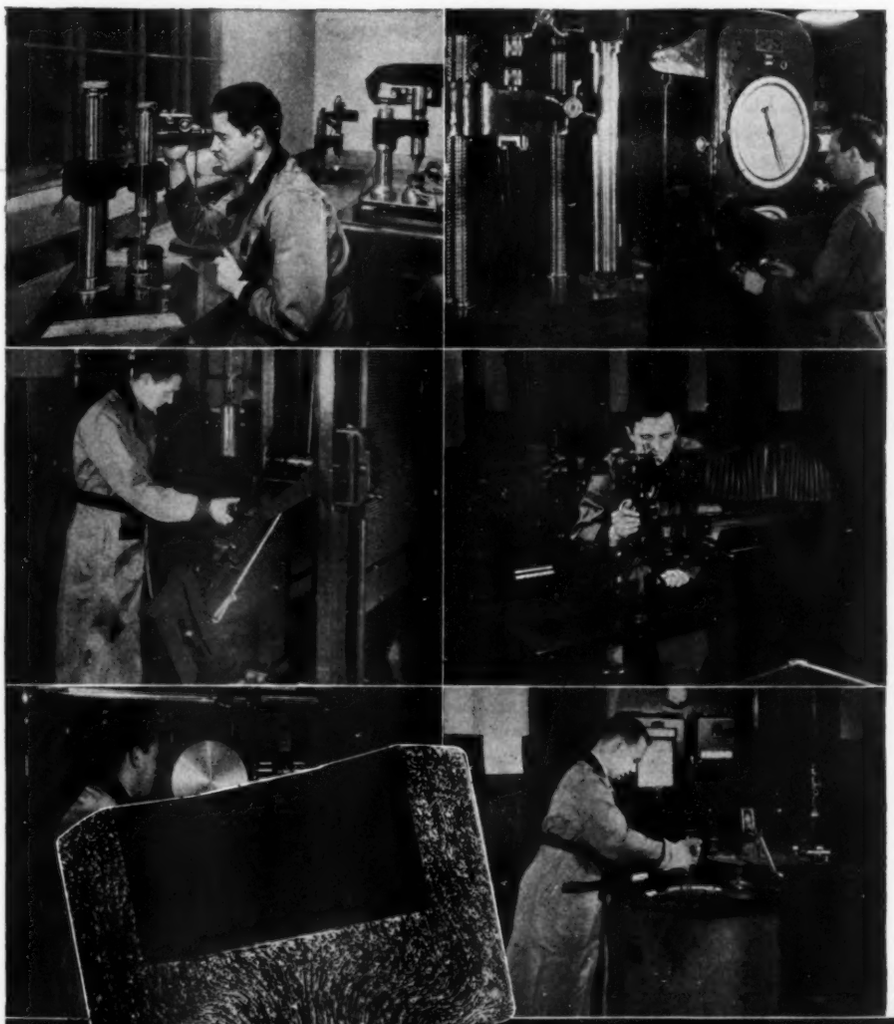

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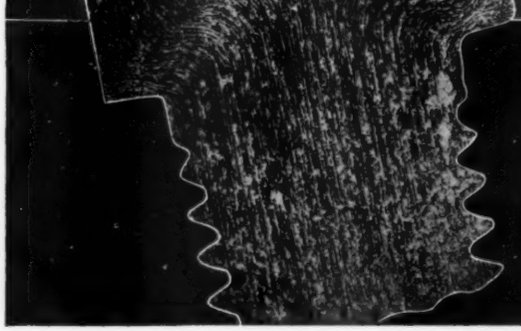

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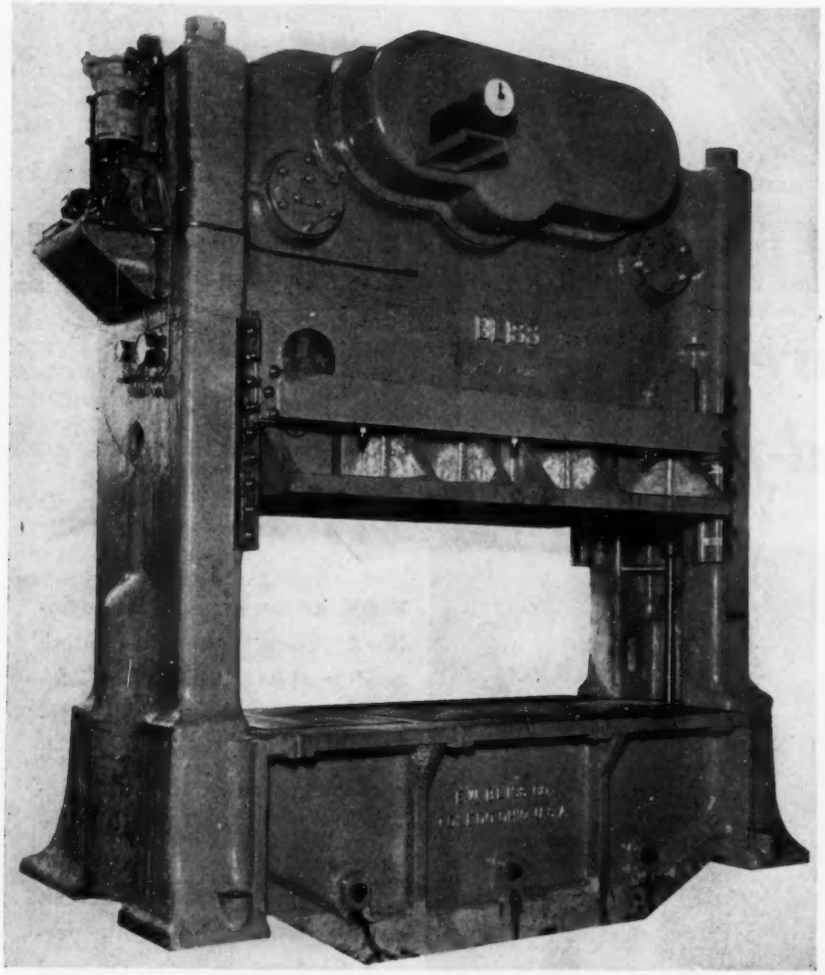


Bliss Two-Point Suspension Single or Double Action Press

Motion to the slide of the No. 2E–7½–108 two-point suspension, single or double action press, announced by The E. W. Bliss Co., 53rd St. and Second Ave., Brooklyn, N. Y., is accomplished through heavy, full eccentrics cast as a unit with the bull gears. Intermediate shaft gears and pinions are cut with herringbone teeth. The entire drive unit, consisting of gears and eccentrics, is totally inclosed in the crown. Lubrication of this unit is by a combination oil pump and filter. Oil drains into a large receiving pocket from where it is drawn back, filtered and pumped into the system again.

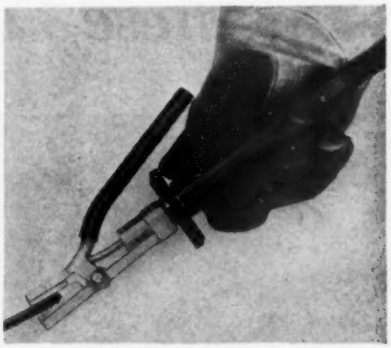
Air counterbalance cylinders are mounted in the bed, with the rods running inside the uprights. The multiple disk flywheel-type air-friction clutch and brake, the motor-driven slide adjustment and the brake are mounted at the rear to eliminate as many projections as possible. An indicator on the crown shows the position of the eccentrics, so that a quick glance will inform the die setter or the operator whether the slide is at top stroke and, also the direction of motion of the slide. A graduated scale on the right-hand gib, with a pointer on the slide, tells at what distance the slide is adjusted up or down, and the remaining distance that it can be moved up or down as the case may be, thus reducing die set-up time.

There are three 24-in. diameter, 5-in. stroke externally guided pneumatic cushions in the bed. These cushions have extra long guides to insure accurate alignment under uneven loading conditions. Press has a 10 in. stroke with a 5-in. adjustment of slide, by reversible electric motor. The diespace, distance from bed to slide, stroke down, adjustment up is 30 in. The bolster is 60 x 108 in., front to back by right to left, and 6-in. thick. Distance between the uprights is 108 in. to clear, while the over-all height of the press is under 13 ft. (14)

Tweco Improved Electrode Holder

Spring tensioning member of the welding electrode holder announced by Tweco Products Co., 111 W. 3rd St., Wichita, Kansas, is inclosed. Spring tension is adjustable to suit size of electrode. Holder jaws, aside from having regular grooves, have a positive angular position electrode lock from which the rod cannot fall out of position.

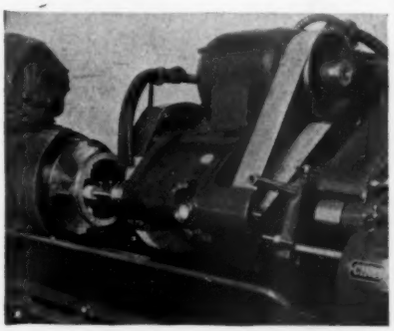
These holders are available in four sizes, the smallest, No. 200, be-

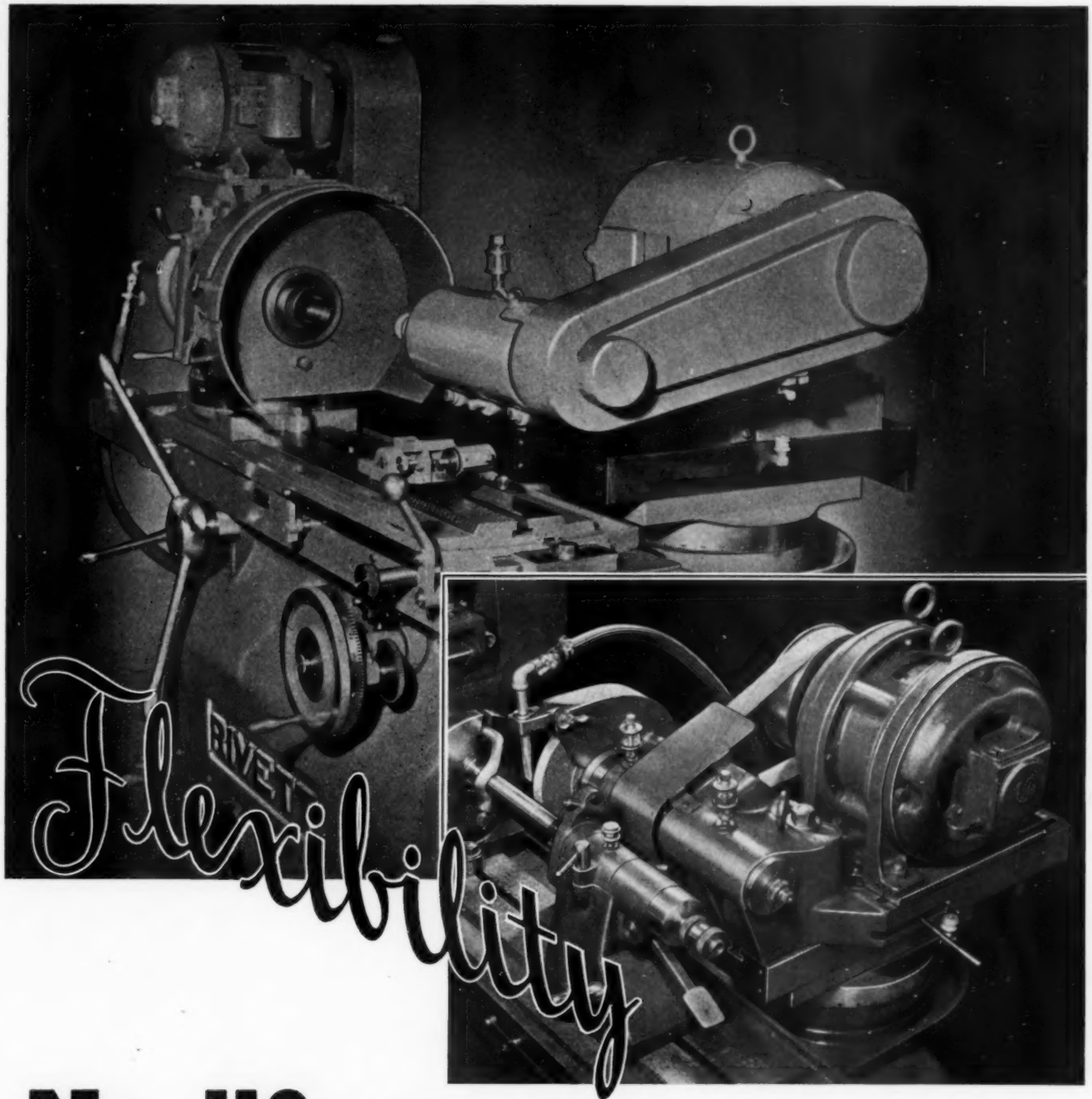


ing 11 in. long and weighing 22 oz. Capacity of this holder is 1/16 to 3/16 in. electrodes and 200 amp. The largest, No. 400-MHS is 11 in. long and weighs 28 oz. Capacity is 1/16 to 3/8 in. electrodes and 400 amp. A sheet metal hand shield is provided on this holder to protect the operator's hand when welding heavy work. (15)

Cincinnati Hinged Internal Attachment

A motor-driven, hinged-type internal grinding attachment for use on universal grinding machines is offered by Cincinnati Milling Machine and Cincinnati Grinders, Inc., Cincinnati, Ohio. This attachment, arranged for permanent mounting on the machine and hinged at the front of the grinding wheel head for rapid and accurate setting up, has been developed for the Cincinnati 12 and





No. 112 UNIVERSAL GRINDER

Primarily is for medium and large internal and external tool-room grinding, straight, bevel, two angle or straight and bevel at one setting. Wide range of adjustments makes it effective on a great variety of work while its extreme simplicity of design enables any mechanic to operate it. Complete specifications sent on request.

RIVETT LATHE & GRINDER INC.
BRIGHTON, BOSTON, MASS.

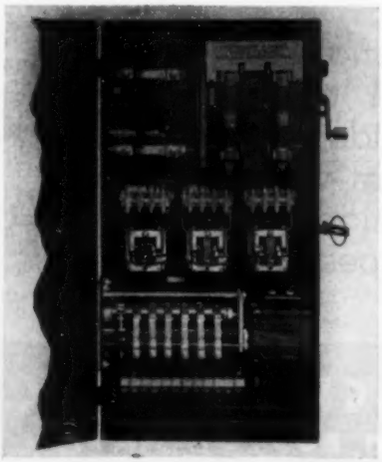
16 in. universal grinding machines. It is claimed that this attachment always is in accurate alignment because the swivel setting of the wheel head remains the same for both straight external and straight internal work. Some types of work require external and internal grinding, and for such work, this attachment often permits both operations to be accomplished without removing the work from the chuck.

Attachment is driven by an individual motor, rated at 2 hp., mounted on a cover plate at the top of the wheel head unit. Hinged at the front end of the plate, on an adjustable, anti-friction bearing hinge, is the internal spindle housing. When the attachment is swung down into working position, a single hinged bolt clamps it to a machined pad in front of the wheel head casting. An endless flat belt drives the spindle attachment. This belt may be left on the pulleys, for the sake of convenience, when the attachment is swung up and out of the way for external grinding.

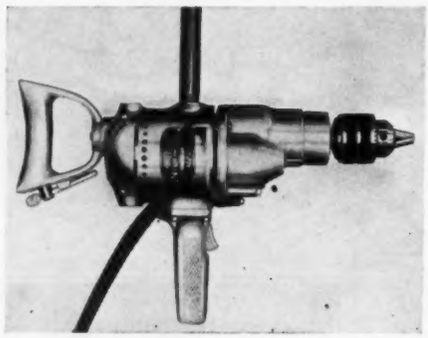
This internal attachment has a capacity ranging from 5/16 to 4 in. in diameter and 1½ to 6½ in. depth of hole, using ¼ to 2 in. diameter wheels, depending upon the spindle chosen. Any one of 7 different spindles may be specified. Speeds also depend upon the spindle chosen, varying from 10,000 to 18,000 r.p.m. **(16)**

G. E. Magnetic Punch-Press Control

Developed to minimize the possibility of false operation, a control system for punch presses actuated by air clutches has been announced by General Electric Co., Schenectady, N. Y. Consisting of a magnetic control panel, a rotating cam-type limit switch and oil-proof pushbutton stations, this control permits four different operations from "continuous stroke" to "inching."



All pushbuttons, limit switch contacts and contactor coils are connected in the secondary circuit of a specially designed control transformer. This makes it impossible for a ground at any point in the system to energize the solenoid falsely. The rotating cam-type limit switch is so designed that the contacts are opened by a positive cam action in order to minimize the possibility of the press continuing to run because of failure of the contacts to open properly. **(17)**



B.&D. "Utility" Power Drills

Available in ⅝, ¾ and ⅞ in. capacities, the "Utility" line of power drills announced by The Black & Decker Mfg. Co., Towson, Md., are designed to furnish power enough for any drilling job with a spindle speed adapted to utility service. These tools can be used for drilling with carbon bits, driving wood augers, cutting with hole saws and powering cylinder hones and grinders. Universal motor operates either on d.c. or a.c. and the drills are available for 110, 220 or 250 volt service. Over-all length ranges from 18 in. for the ⅝-in. capacity drill to 19¼ in. for the ⅞-in. drill. Weight ranges from 17 lb. to 19¼ lb. Full-load speed is 175, 150 and 120 r.p.m. for the three respective sizes. **(18)**

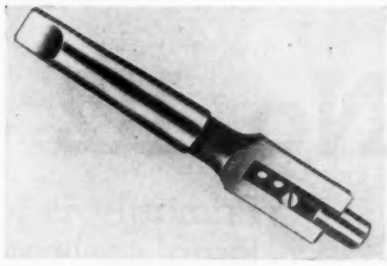
Hanna Portable Squeeze Riveter

Weighing less than 100 lb., this portable pneumatic squeeze riveter, announced by Hanna Engineering Works, 1765 Elston Ave., Chicago, Ill., has capacity for setting ¼ and 5/16-in. rivets cold. It may be used for setting vertical rivets, or rotated for driving horizontal rivets. Machine may be suspended from a balancer to provide all vertical movements. Universal suspension bail permits the use of the riverter

in any position and may be tilted from side to side to more easily enter some work. The operating valve is in the rear cylinder head and is used to guide the riveter. After completing the power stroke, the valve automatically reverses, returning the dies to "open" position ready for the next rivet. An operating speed of 50 strokes per min. is provided. **(19)**

C & W Counterbores

The "Clean-Cut" counterbore offered by C & W Tool Co., Div. Perfection Marker & Die Co., 19 Chestnut St., Cambridge, Mass., consists of a two-lipped cutter with an interchangeable pilot. Design is claimed to make for fast and clean cutting, especially in deep counterboring, since there is ample chip clearance. Pilot has been designed to support the cutting edge, insuring strength and accuracy. Pilot may be removed and the cutter quickly sharpened. **(20)**



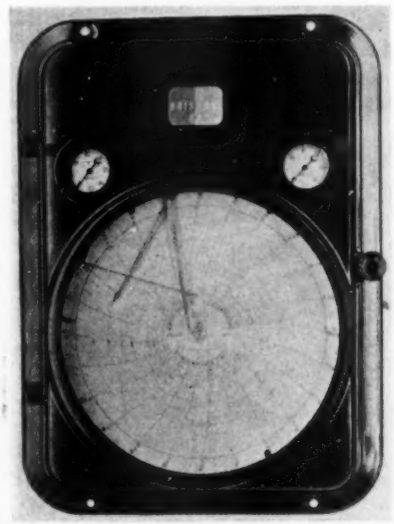
Milburn "M-Lock" Paint Spray Cover

Designed for attaching paint containers to siphon-feed spray guns, the "M-Lock" cover announced by The Alexander Milburn Co., 1416 W. Baltimore St., Baltimore, Md., permits the use of paint cans and enables the user to make changes in colors without cleaning out standard containers. Cover is a light-weight,

non-corrosive stamping which locks in any position on the circumference of the standard aluminum container or the original paint can. Lip has a flange which fits over the rim of the container and seals against leakage with a fluid resisting gasket. Lock is made of steel spring clamps, fitting the circumsference and clamping under the steel band of the container. These clamps revolve in any direction and are tightened with a lock nut. Cover will fit standard quart-size paint cans such as are furnished by the leading manufacturers of paint. (21)

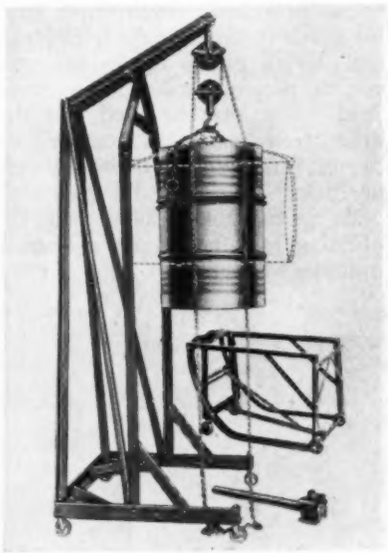
Bristol Free-Vane Reset Controllers

The Bristol Co., South Main St., Waterbury, Conn., has announced a free-vane, air-operated controller with wide throttling range and automatic reset which provides for point control. These controllers are adaptable to various types of continuous processes, which involve the control of such variable as temperature, pressure, vacuum, flow and liquid level. Any load change, accompanied by a movement of the pen away from the control point, produces a change in the controlled air pressure of sufficient value to give the diaphragm control valve the required opening to bring the variable back to the control point. (22)



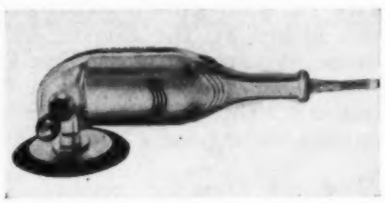
Morse No. 20 Drum Crane

Suitable for handling steel drums weighing up to 800 lb., the No. 20 portable drum crane offered by Morse Ufg. Co., Inc., 400 S. Franklin St., Syracuse, N. Y., weighs only 150 lb. Equipped with four casters, this unit is easily moved about. Drums may be lifted either endwise or horizontally to a height of more than 50 in. in the clear. Total height is 9½ ft. and the base is 40 in. square. A No. 32 chain hoist of one-half ton capacity ordinarily is used with this crane. The drum truck shown in the background also is available. (23)



Skilsaw Model N Disk Sander

Specially designed for smoothing fracture welds in cast metals, for auto body and fender repair work and for removing spot-weld marks, the Model N disk sander announced by Skilsaw, Inc., 230 N. Michigan Ave., Chicago, Ill., has a no-load speed of 3,600 r.p.m. Pad diameter is 7 in. and motor is universal for either d.c. or a.c. up to 60 cycle. Standard voltage is 110 volts, but these sanders can be furnished for 32, 220, 250 and odd voltages. A single pole, thumb-operated slide switch is provided in the handle for convenient control. Length over-all is 15¾ in., not including the pad. (24)

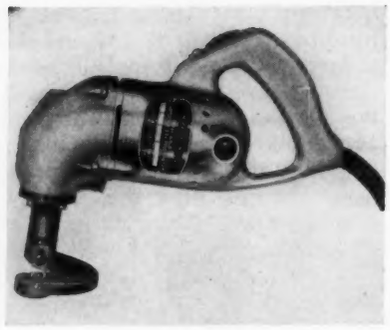


"Per-Fect-O" No. 777 Portable Boring Bar

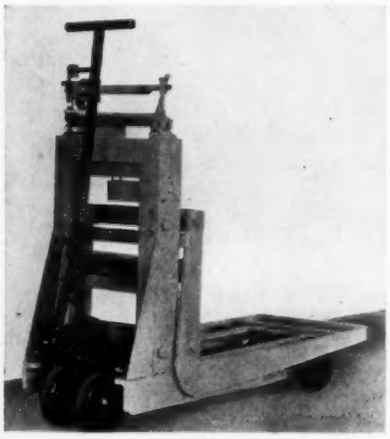
Van Norman Machine Tool Co., 160 Wilbraham Ave., Springfield, Mass., offers the "Per-Fect-O" No. 777 portable vertical boring bar unit, which will bore or sleeve any diameter from 2.600 to 5.343 in. Machine is a complete unit, has two feeds and two speeds, and will take a 0.050 in. cut at any diameter within its capacity. Gears are totally inclosed and lubricated for life. This unit has four non-revolving, expansible cats-paws which guide the flycutter through the cut. A½-hp. capacitor motor is used. (25)

B.&D. Portable "Lectro-Shear"

Available in 18 and 16 gage sizes, the portable "Lectro-Shear" offered by The Black & Decker Mfg. Co., Towson, Md., is so constructed that the shearing action is accomplished by the rapid reciprocating action of a vertical blade against a stationary horizontal blade. This horizontal blade is set in a shoe which indicates the correct cutting angle and adapts the tool to all types of work. It is not necessary to adjust blades for varying gages or types of metal. Blades can be reground without special fixtures. This tool will cut on a radius as small as ¾ in. and easily follows a straight or patterned



line. Cutting speed at full-load is 1,500 strokes per min. for both sizes. Net weight is 6¾ lb. for the No. 18 shear and 8 lb. for the larger.

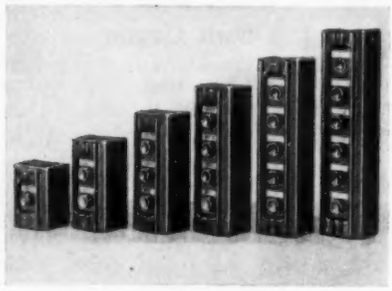


Barrett Beam-Type Scale Truck

Available in 3,500 and 5,000 lb. capacities and of single or multiple stroke types, Barrett beam-type scale trucks, manufactured by Barrett-Cravens Co., 3255 W. 30th St., Chicago, Ill., enables lift-truck users to perform weighing or counting operations during the transfer operation. These trucks are available in widths of 19 and 25 in. and with lengths of 36, 42, 48 and 54 in. Lowered heights are 7, 9 and 11 in. Lifting heights range from 1⅝ to 6 in. Design permits the use of the scale truck with any type of skid having a minimum clearance of 7½ in. **(27)**

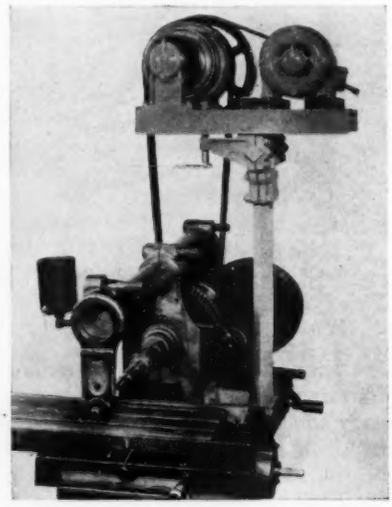
Westinghouse Type HD Pushbutton Units

Designed for heavy-duty a.c. and d.c. control circuits, the type HD pushbuttons, announced by Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., are available in eight different units, including lamp receptacle and rotary selector switches. These may be grouped together in desired combinations to meet practically all application requirements. Each unit is self-contained and does not require additional insulation for mounting. They are suitable for built-in control or for panel mounting. **(28)**



Production Type 228 Motorization Drive

Designed for motorizing cone pulley machines, the Type 228 drive offered by the Production Equipment Co., 5219 Chester Ave., Cleveland, Ohio, provides a rigid drive base on which is mounted the motor and ball-bearing pillow blocks for supporting the countershaft. Any standard motor may be used and the drive from motor to countershaft can be furnished either with V-belt or chain. Types of adjustable supports are available to allow ready application to lathes, screw machines, millers and shapers. **(29)**

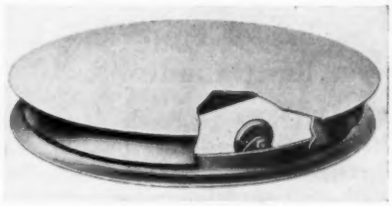


Dumore Type HL Universal Motor

Type HL plain series universal motors, offered by The Dumore Co., Racine, Wis., consist of the Type H motor fitted with a single-reduction gear unit. This motor has a totally inclosed housing and a 30 min. rating. A double gear-shaft extension is provided. Net weight of the complete unit is 2 lb. Type HVL motor is identical with the Type HL, except that the latter has a ventilated housing and continuous 40 C. rise. **(30)**

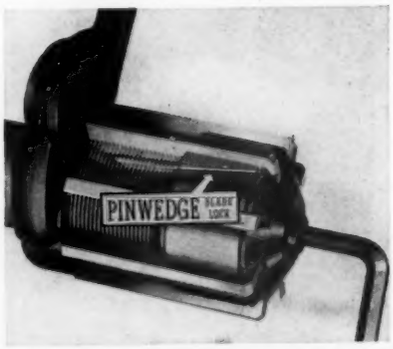
Binks Roller-Type Painting Turntable

Designed for use in spray booths for rotating heavy objects in front of the operator, these roller-type turntables offered by Binks Mfg. Co., 3114-26 Carroll Ave., Chicago, Ill., can be furnished for bench mounting or with legs for use in a floor-type booth. These units are available in diameters from 18 to 60 in. **(31)**



B.-C. "Masterall" Expansion Reamer

Barber-Colman Co., River and Loomis Sts., Rockford, Ill., has announced the development of a positive, adjustable expansion reamer



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35 NEW PRODUCTS

The SHOP EQUIPMENT NEWS items will be found on the preceding pages (291-300). . . . At the end of each item is a NUMBER . . . circle the corresponding number of items in which you are interested on the coupon under the heading "NEW PRODUCTS."

49 TRADE PUBLICATIONS

The TRADE PUBLICATIONS will be found on Pages 301-302. . . . Each item carries a NUMBER . . . circle the number of the items in which you are interested on the coupon on page 302 under the heading "TRADE PUBLICATIONS." BE SURE TO CIRCLE NUMBERS UNDER THE PROPER HEADING. . . .

AN EASY WAY TO GET BUYING DATA FOR SELECTING SHOP EQUIPMENT, TOOLS, MATERIALS, OR SUPPLIES

1 **SURFACE GRINDERS** A 20-page catalog, No. GL-100, offered by Gallmeyer & Livingston Co., Grand Rapids, Mich., discusses the features of a number of high-speed hydraulic feed surface grinders. Specifications are tabulated.

2 **NEEDLE BEARINGS** A number of informative advertisements discussing features of Torrington needle bearings have been reprinted in a bulletin offered by The Torrington Co., Torrington, Conn.

3 **GEAR FINISHER** A six-page bulletin offered by Michigan Tool Co., Detroit, Mich., discusses the features of the new No. 860 gear finisher.

4 **LIFT TRUCKS** A large 20,000 lb. capacity hand-lift truck is described in a four-page folder, No. P-347, offered by the Yale & Towne Mfg. Co., Philadelphia, Pa.

5 **PRECISION LATHES** Two folders announced by Sidney Machine Tool Co., Sidney, Ohio, discusses the features of "Monotrol", "Tritrol" and sliding spur-tooth geared-head lathes. Specifications are tabulated for the various models.

6 **WELDING EQUIPMENT** Bulletins No. GEA-2776, GEA-2704 and GEA-2791, offered by General Electric Co., Schenectady, N. Y., list and describe the features of gasoline-engine-driven arc welders, arc-welding accessories and "Thyratron" control for spot welders.

7 **STRESSPROOF STEELS** Bulletin No. 30, announced by LaSalle Steel Co., Chicago Ill., discusses the stressproofing process and the features of "Stressproof" steels.

8 **SHAPE CUTTING** Geweco automatic shape cutting machines are described in a folder offered by General Welding & Equipment Co., Cambridge, Mass.

9 **LUBRICATORS** "Acco-Morrow" pressure lubricators for industrial use are described in a four-page bulletin, No. DH-1058, announced by American Chain & Cable Co., Inc., York, Pa. Several models are available.

10 **ROLLER BEARINGS** Specifications, tolerances and load rating data for self-contained roller bearings are tabulated in Bulletin No. 14, published by The Heim Co., Fairfield, Conn.

11 **RECTIFIERS** A 12-page illustrated bulletin, No. B-2113, offered by Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., outlines the characteristics of "Rectox" rectifiers and gives a list of applications.

12 **MACHINIST'S TOOLS** Union Tool Co., Orange, Mass., has announced publication of an 18-page catalog, No. 38, in which are listed and described a number of precision tools for machine shop use.

13 **PIPE FITTINGS** Style 65 "No-Thread" pipe fittings are listed and described in a 16-page booklet, Form No. 381A, announced by S. R. Dresser Mfg. Co., Bradford, Pa.

14 **B & D CATALOG** Portable electric tools of a wide range of types and sizes are listed and described in the 1938 catalog announced by Black & Decker Mfg. Co., Towson, Md.

15 **SPEED REDUCERS** A catalog describing WHS speed reducers has been published by Winfield H. Smith, Inc., Springville, Erie Co., N. Y. Worm gear, single and double reduction, and planetary-type speed reducers are shown.

16 **PLUG GAGES** "Crobalt" thread plug gages are discussed in a four-page bulletin offered by Detroit Tap & Tool Co., Detroit, Mich.

17 **VERTICAL MILLERS** "Super-Speed" vertical milling machines, available in three sizes, are described and illustrated in catalog No. 1400-A offered by George Gorton Machine Co., Racine, Wis. These millers have speeds ranging up to 6300 r.p.m. with standard equipment and up to 12,000 r.p.m. with special equipment.

18 **BRONZE VALVES** "500 Brinell" bronze globe valves having hardened stainless steel seats and disks are described in an 8-page bulletin No. 4-4500, offered by Hancock Valve Division, Manning, Maxwell & Moore, Inc., Bridgeport, Conn.

19 **TEMPERING** "Modern Homo Tempering" is the title of a 4-page folder No. F-T625 (6), published by Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa. This folder shows a battery of Homo furnaces used for parts tempering in a drive-chain plant.

20 **COMBINATION SHEARS** Catalog "M," announced by Henry Pels & Co., Inc., 90 West St., New York, N. Y., discusses a number of combination punches, shears and notchers for a variety of plates, angle and bar operations.

21 **PORTABLE PYROMETER** A moisture-proof switch, Part No. 80S, and a pocket-size portable pyrometer potentiometer, Part No. 73PO, are described in bulletins offered by the Lewis Engineering Co., Naugatuck, Conn. The portable potentiometer is available with 14 scale ranges.

22 **BAKELITE LAMINATED** A 48-page illustrated booklet, offered by Bakelite Corp., 247 Park Ave., New York, N. Y., discusses the individual physical, electrical and mechanical properties of various laminated sheets, tubes and rods made from Bakelite materials.

23 **GALVANIZED ROOFING** A 4-page folder featuring "StormSeal" galvanized roofing has been issued by the United States Steel Corp. Subsidiaries, Pittsburgh, Pa.

24 **MONARCH LATHES** A 28-page booklet entitled "Let's Take a Look at Monarch" and discussing the company's facilities for manufacturing lathes has been published by The Monarch Machine Tool Co., Sidney, Ohio. This fully-illustrated booklet shows interior views of the Monarch plant.

25 **HYDRAULIC PRESSES** Type V-2 hydraulic presses for broaching and assembly work are described in a four-page bulletin offered by American Broach & Machine Co. Div., Sundstrand Machine Tool Co., Ann Arbor, Mich.

26 **PRECISION INSTRUMENTS** A 64 page catalog, No. M-138, entitled "Instruments of Precision" has been published by The Gaertner Scientific Corp., Chicago, Ill. This catalog contains detailed descriptions of measuring microscopes, comparators, dividing machines and similar instruments.

SEND US THE COUPON BELOW . .

And the literature you circle will be sent to you within two weeks without cost.

27 DIAMOND TOOLS A 24-page booklet discussing proper grinding wheel dressing technique is offered by Koebel Diamond Tool Co., Detroit, Mich.

28 OPERATING VALVES A 16-page booklet discussing air control valves has been published by Ross Operating Valve Co., Detroit, Mich.

29 GEAR CHUCKS "Match-It" gear chucks and a universal gear chucking gage are described in an eight-page bulletin announced by LeMaire Tool and Mfg. Co., Dearborn, Mich.

30 COOLANT PUMPS "Rollway" and "Pioneer" coolant and lubricant pumps are described in bulletins recently offered by Pioneer Engineering & Mfg. Co., Detroit, Mich.

31 BRAZING FURNACE "Electroblast" hydrogen brazing furnace for economical heat-treating of high speed and carbon steels and for brazing carbide-tipped tools is described in a six-page bulletin announced by Stark Tool Co., Waltham, Mass.

32 LOCKING DEVICES The "Grippit" jig and fixture lock, designed to meet the need for a two-action set screw, is described in a four-page bulletin offered by Wedge-Lock Tool Co., Chicago, Ill.

33 INVOLUTE SPLINES The Illinois involute spline system is discussed in detail in an eight-page bulletin published by Illinois Tool Works, Chicago, Ill. Dimensions are tabulated for standard 6- and 10-spline shafts and fittings.

34 PRECISION GRINDER The "Olofson" precision grinder head for use on jig borers and engine lathes, as well as boring and milling machines., is described in a four-page bulletin offered by Buell Die and Machine Co., Detroit, Mich.

35 COLLETS Standard lathe and milling machine collets are listed with major dimensions and prices in a four-page bulletin published by Sutton Tool Co., Detroit, Mich.

36 SABECO BRONZE A booklet discussing the properties of "Sabeco" bronze is offered by Fredericksen Co., Saginaw, Mich. Physical characteristics and recommended uses for the different grades are tabulated.

37 SPUR GEARS Bulletins discussing facilities for cutting standard steel spur gears and the properties of silent laminated spur gears are offered by Braun Gear Corp., Brooklyn, N.Y.

38 HYDRAULIC PRESSES "Hydro-Steel" self-contained, utility-type hydraulic presses ranging in capacity from 5 to 25 tons and with strokes to suit individual requirements are described in Bulletin No. H-100A announced by Logansport Machine, Inc., Logansport, Ind.

39 MAGNETIC CHUCK The "Magna-Sine" magnetic sine table for use on surface grinding machines is discussed in a mailing folder being distributed by Robbins Engineering Co., Detroit, Mich.

40 DIE CASTING MACHINES Bulletins offered by The Phoenix Ice Machine Co., Cleveland, Ohio, discuss the features of Lester HHP-1 and HHP-2 die casting machines. The small unit is suitable for castings averaging 1 lb., while the larger machine is universal in type and handles any shape of casting up to 5 lb.

41 "TECO" METAL An application chart tabulating grades of "Teco" Tungsten carbide metal recommended for cutting various types of material under heavy, average or light cuts is offered by Super Tool Co., Detroit, Mich.

42 HYDRAULIC PRESS Bulletin No. 3801, announced by The Hydraulic Press Mfg. Co., Mt. Gilead, Ohio, discusses the features of the Hydro-Power "Fastraverse" hydraulic press.

43 BENCH SHAPER The "Ammco" 6-in. crank-type bench shaper is described in an 8-page illustrated bulletin offered by Automotive Maintenance Machinery Co., North Chicago, Ill.

44 TOOL BITS Standard, "Imperial" and "Gormet" ground tool bits and turning tools, as well as standard ground cutoff blades are listed and described in a 6-page bulletin offered by Gorham Tool Co., Detroit, Mich.

45 STEAM-JET EJECTORS A 20-page bulletin, Form No. 9046, announced by Ingersoll-Rand Co., New York, N.Y., covers single-, two- and three-stage steam jet ejectors for removing air, gas or vapors from condensers and vacuum chambers in industrial processes.

46 ELECTRIC FANS The Emerson Electric Mfg. Co., St. Louis, Mo., offers a 1938 catalog describing "Emerson-Seabreeze" ventilating fans. A folder No. X2414, also offered, discusses the five-year factory-to-user guarantee.

47 CUTTING OILS A 48-page booklet entitltd "The Story of Sulphurized Cutting Oils" is offered to engineers and executives of metal-working plants by D. A. Stuart Oil Co., Chicago, Ill. This well-illustrated booklet features the scientific application of cutting fluids on metals of different analyses.

48 LUBRICATORS Bijur Lubricating Corp., Long Island City, N. Y., is distributing a 12-page bulletin illustrating typical applications of automatic, centralized-pressure lubrication systems.

49 FORGINGS Advantages gained through the use of forgings are discussed in a four-page bulletin offered by Drop Forging Association, 605 Hanna Bldg., Cleveland, Ohio.

TO MAKE YOUR BUYING EASIER

Keep posted on the new developments in the Metal-Working Industry. Simply circle the numbers of the literature in which you are interested on the coupon just below. BE SURE YOUR COMPANY NAME and TITLE appear on this coupon. *NO REQUESTS WILL BE FILLED AFTER EIGHT WEEKS FROM THE PUBLICATION DATE (4-6-38).*

NEW PRODUCTS . . . See Pages 291-300

Please send me, without obligation, further information on the new products described in the Shop Equipment News section.

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21
22 23 24 25 26 27 28 29 30 31 32 33 34 35

TRADE PUBLICATIONS . . . On Pages 301-302

Please send me, without obligation, the literature circled below. (Numbers correspond to descriptive paragraph numbers.)

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21
22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42
43 44 45 46 47 48 49

NAME ..... TITLE .....

COMPANY .....

ADDRESS .....

that can be adjusted by hand. It is available both in shell and shank types and is identified with the name "Masterall." Blades of these reamers, either high speed steel or carbide tipped, fit in slots accurately milled in the hardened alloy steel reamer body. Bottoms of the blades are ground to fit in the bottom of the milled slots and lengthwise movement of the blades produce expansion or contraction of the size of the reamer.

A specially designed Pinwedge blade lock, having round and rectangular legs that, when pushed back by the locking plate, locks the blades in position. By removing the setscrew and lock plate, the threaded screw hole provides a center for sharpening the reamer. An adjusting collar, fitted to the threaded portion of the reamer body, is used for pushing the blades forward for expansion and also is used as a stop when the blades are tapped back into the desired position. A Spanner wrench is used to adjust this collar. Shank-type reamers are available in diameters ranging from $\frac{1}{16}$ to 3 in. diameter and shell-type reamers are offered in diameters ranging from $1\frac{1}{2}$ to 3 in. **(32)**

McKay Shielded-Arc Welding Electrodes

A complete line of shielded-arc welding electrodes has been announced by The McKay Co., McKay Bldg., Pittsburgh, Pa. The line includes electrodes for general purpose welding, light sheet metal work, a.c. transformer welding machines, and for vertical and overhead welding. **(33)**

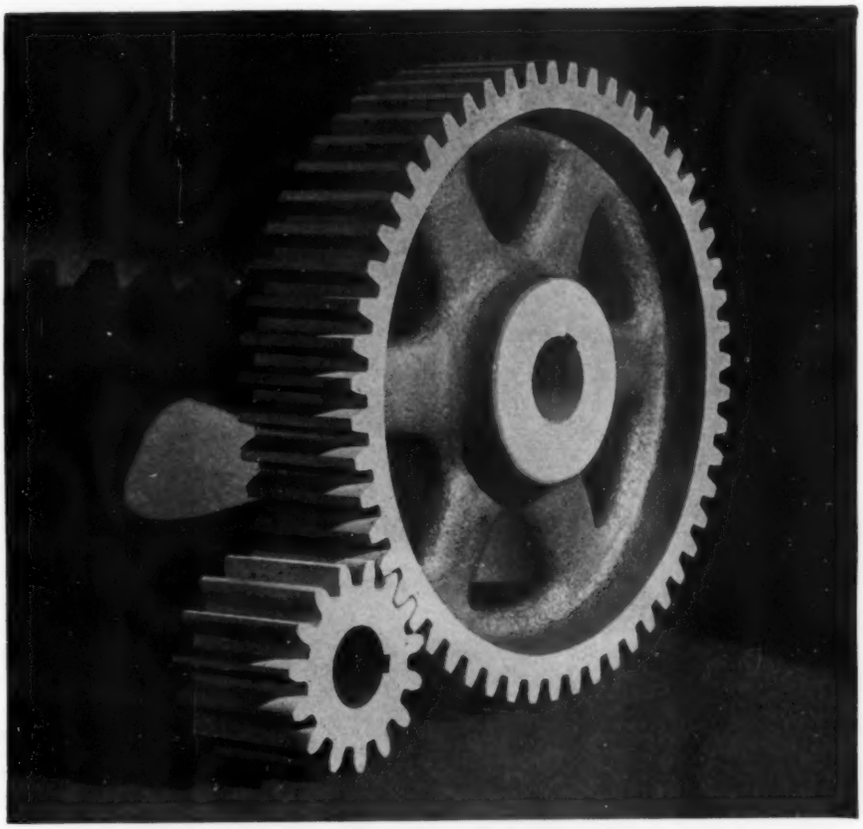
Durez No. 5116 Resin Adhesive

Claimed to be particularly efficient in bonding asbestos to sheet steel, rubber to metal or cellulose acetate materials, plastic molded parts, porcelain enameled parts, and cellophane or treated papers to steel, copper wire or wood, No. 5116 resin adhesive announced by General Plastics, Inc., North Tonawanda, N. Y., is unaffected by water, moderate heat, alkalies and mild acids. It is stated that this material, in solution with a hydro carbon solvent, has exceptionally high bonding strength. Used as a coating, it withstands a 50 per cent caustic soda solution indefinitely. Bonding strength is retained up to 100C. Softening point is between 115 and 120C. **(34)**

Smootharc "Harmang" Welding Electrodes

Smootharc "Harmang" welding electrodes, offered by The Harnischfeger Corp., 4400 W. National Ave., Milwaukee, Wis., are designed for welding on parts subject to heavy impact. Base metal of these electrodes is nickel manganese steel, ranging from 11 to 14 per cent nickel manganese and $3\frac{1}{2}$ to $4\frac{1}{2}$ per cent nickel. Carbon content is in excess of 1 per cent.

Slag coating, which stabilizes the arc and protects the metal against loss of carbon and manganese, is kept to a minimum, so as not to interfere with the rapid cooling required to form an austentitic deposit. With cold working, such as hammering and peening, the soft manganese deposit becomes an extremely hard martensite layer, which offers resistance to impact and abrasion. These electrodes operate with the work negative and the electrode positive and are available in sizes



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● From an ounce to 20,000 pounds . . . all Horsburgh & Scott gears, whether spur or any other kind in industrial use, are of the rugged "husky" type . . . built to endure. A half century of experience, unceasing vigilance in the selection of materials and painstaking care in design and manufacture, make Horsburgh & Scott gears the finest in the world. You'll find proof in their trial.

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GEARS AND SPEED REDUCERS

HAMILTON AVENUE, CLEVELAND, OHIO U. S. A.

from $\frac{1}{8}$ to $\frac{1}{4}$ in. diameter, for use with currents ranging from 90 to 140 amp. (35)

TRADE PUBLICATIONS

CERAMICS A 16-page, fully illustrated booklet entitled "Research for Ceramic Industries" has been published by Battelle Memorial Institute, 505 King Ave., Columbus, Ohio. A general discussion of the Institute's work in ceramics is given.

CLUTCHES "Over-Center" clutches, available for operation in oil or dry and made in sizes ranging from 7 to 20 in. in diameter of faced driven member, are discussed in a four-page bulletin, Form No. OC-100, offered by Rockford Drilling Machine Div., Borg-Warner Corp., 202 Catherine St., Rockford, Ill.

DIESEL ENGINE A catalog page, Form No. 1823-4675, offered by Caterpillar Tractor Co., Peoria, Ill., gives performance data and specifications for the new six-cylinder, 66 hp., No. D4600 industrial-type diesel engine.

DIESEL ENGINES The Norman W. Henley Publishing Co., 6 West 45th St., New York, N. Y., has announced publication of a chart entitled "Systematic Location of Diesel Engine Troubles". This chart has been prepared by Victor W. Page and is offered at a price of 50 cents per copy.

GENERATORS A 12-page, fully illustrated booklet, Form No. 4658, announced by Caterpillar Tractor Co., Peoria, Ill., discusses use for diesel-powered electric generator sets and lists ratings of the eight sizes of "Caterpillar" powered generator sets now available.

INSTRUMENTS Three bulletins, announced by General Electric Co., Schenectady, N. Y., discuss the use of electric instruments in manufacturing industries. "Instruments in Industry", Bulletin No. GES-1841, is a new house organ which will be issued periodically by the Meter Division. Bulletins No. GEA-2011A and No. GEA-2635 discuss the features of the AP-9 portable indicating meter and a line of recording instruments.

MILLING PRACTICE A 16-page bulletin entitled "Milling Machine Practice", is being distributed by Cincinnati Milling Machine and Cincinnati Grinders, Inc., Cincinnati, Ohio. This bulletin is reprinted from Kent's Mechanical Engineers Handbook and consists of material originally furnished by the Cincinnati Milling Machine Co.

PUMPS The Pioneer Engineering & Mfg. Co., 31 Melbourne Ave., Detroit, Mich., has compiled a comprehensive 45-page engineering data book covering coolant and lubricant pumps and their correct application to machine tools and industrial processing equipment. This book is available to industrial executives when requested on a business letterhead.

SOUTH AMERICA The 1938, or fifteenth annual edition of the "South American Handbook" offered by The H. W. Wilson Co., 950-72 University Ave., New York, N. Y., is designed to give the trade a complete picture of each separate republic in Latin America. Price, $1 postpaid.

STEEL CASTINGS American Foundrymen's Association, 222 West Adams St., Chicago, Ill., has published a 62-page booklet entitled "The Influence of Design on the Stress Resistance of Steel Castings". This is preprint No. 37-35 and was

It's not only how accurate a new precision tool is that counts, it's how accurate it is after it has been on the job.

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Because of their design and construction, and because they are made only of special analysis steels best suited to the purpose, Lufkin Precision Tools retain their accuracy after years of use.

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NEW YORK 106 Lafayette St. THE LUFKIN RULE CO. SAGINAW, MICHIGAN Canadian Factory WINDSOR, ONT.

TAPES — RULES — PRECISION TOOLS

prepared by the late Major R. A. Bull. The paper deals with the basic principles of steel casting design and with the development of the steel casting industry. Price, 35 cents per copy.

Sixty Years Ago

The following items appeared in *American Machinist* dated April, 1878:

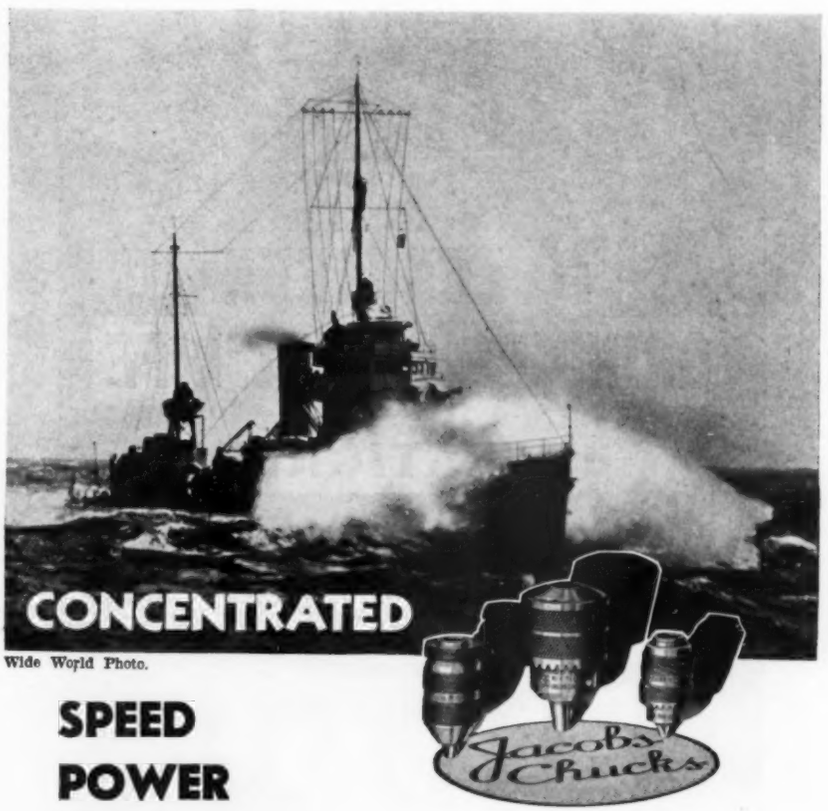
The popular idea with essayists seems to be that the whole community is divided into two classes, represented by the capitalist and the laborer, the former possessing all the money and the latter all the muscle; that these two classes are arrayed against each other, like Russia and Great Britain, both striving for the advantage in some expected settlement of all disputed points, and threatening, in case of final disagreement, the most direful consequences. This is a wrong view, and when discussed from such a standpoint, one likely to lead to mischief. The tendency of such discussion is not only to make the laborer (especially if he be poor) dissatisfied with his lot, and to regard the capitalist as conspiring to deprive him of his just and legal rights but to gradually lead the capitalist to regard the whole class of laborers as standing together to wrest the control of business out of his hands and establish trends for its continuance to suit themselves.

The business of gathering up old boiler tubes taken from discarded and used up boilers heating them in a furnace, drawing them down one size smaller (which gives them the appearance of new tubes) and selling them to innocent parties, *who suppose they are buying new tubes,* has been prosecuted by the Eagle Tube Co. of this city for several months past, and judging from tne activity displayed at their work in West 24th St., near the North River, it must be expanding. They pretend to *manufacture* boiler tubes and advertise that they are "of the best material and warranted." We have heard of several instances where boilermakers have purchased these Eagle tubes on the strength of their guarantee and afterwards experienced much trouble and loss when the true character of the tubes was found out.

The value of emery wheels in machine shops, though every year being more widely recognized, is not yet appreciated to the extent it should be. The grindstone and file cannot be dispensed with, but when used to perform work that can be done on an emery wheel, necessitates a waste of time and, therefore, a great expense for labor. The cost of emery wheels cannot be a serious objection to their use, for one will outlast a number of grindstones and with proper care will pay for itself many times over.

If Congress would adjourn and go home or agree to postpone all financial and tariff legislation until next winter, the business interests of the country would at once feel an immediate relief.

On a late visit to the Corliss Steam Engine Works, Providence, we noticed three large engine bulidings for the New Haven Rubber Works and several other large ones for cotton mills. They employ at present 300 hands. This is believed to be the largest and best equipped steam engine works now in operation in the world.



Wide World Photo.

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Every quality built into a machine goes through the chuck before it reaches the work. Jacobs Chucks are tough, precise units of concentrated speed, power and strength, matching these qualities in any machine on which they are used . . . Speed of operation—rapid tightening and release . . . Powerful jaws, unrelenting in their grip . . . Strength in specially hardened bodies and working parts.

IF IT'S A

Jacobs

IT HOLDS!

THE JACOBS MANUFACTURING COMPANY
HARTFORD CONNECTICUT, U.S.A.

A mammoth lathe, weighing over 20 tons and requiring three cars for its transportation, has been placed in the B.C.F. & N.B.R.R. machine machine shops in Taunton, Mass. It was built by the Putnam Machine Co. of Fitchburg.

Foreman Training Service

A course in foreman training by means of projected pictures and recorded talks is being put out by MacVeagh & Company. Each group of illustrations deals with a specific subject, which when misunderstood, as is often the case, leads to dissention or even disloyalty. The topics in use include safety, teamwork, waste, leadership, mutual understanding, developing understudies, grievances, quality and cost, suggestions, mistakes and errors, and good housekeeping.

The still pictures are projected from 35 m.m. film and are large enough to be easily seen by a group of foremen. The recorded talk is not of the lecture type but is calculated to bring out discussion among the foremen.

Machine Gas Cutting in Railroad Work

The railroads have an enormous problem in maintaining and repairing their locomotives, rolling stock, rails and auxiliary equipment. Formerly, maintenance and repair work was carried on at a large number of small shops. Today the centralized blacksmith, boiler and machine shop has replaced the smaller shops and repair parts are made to standard dimensions and on a production schedule. A large factor in the new scheme of things is the cutting torch in its mechanized form.

The gas-cutting torch cuts through steel of any thickness by heating the steel to a red heat by means of an oxyactylene flame, following by igniting the red hot steel with a stream of oxygen gas. The oxygen literally burns the steel in the line of the cut. On a production basis, the cutting torch is fitted to a mechanical arm which guides the torch at the proper speed. The operator has simply to move a magnetic tracing wheel over the penciled out line of the shape he wishes cut. The mechanical arm carrying the torch duplicates the motion which the magnetic tracer undergoes and the required cut is made with steel. The top and bottom edges of the cut are sharp, and the cut itself compares favorably in every respect with rough machining.

From an address by H. Bass, of the N. Y. Central Shops at Collinwood, Ohio, before the eighteenth annual meeting of the American Welding Society.

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GRINDING WHEEL LIFE
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Liquid Grinding Compound
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Recommended by nearly all grinding machine and grinding wheel makers. Phone or write today for Free Working Sample and 24 page "CODOL" booklet.
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Why Make Production the Goat?

JOHN R. GODFREY

Young Tom Johnson has taken a lot of leaves out of his Dad's book, and written some new ones all his own. Tom is handling the production end of a new washing machine as sort of consulting production manager, and had been having a "run-in" with the general manager just before I saw him. Incidentally, the G. M. is a watchdog put in by the banks to try and save their loans, after the big bust.

When he came out and asked Tom to cut shop costs twenty-five

dollars, Tom broke loose and told the G. M. a few things. Of course, G. M.'s ought to know them but a lot don't seem to.

"Doggone it, Mr. Wilson," said Tom, "I'm sick of having the production end of this business be the goat all the time. If you've studied our production costs you'll see that the Angel Gabriel couldn't cut the cost of production twenty-five dollars because it's under twenty dollars already.

"Why don't you let the other departments take a shot at saving a dollar once in a while? Has your sales manager cut his costs as much as we have in the shop? You know darn well he hasn't. Why not get some smart designer to simplify the machine so we can use fewer parts, or make them easier, or use less costly material? Why not pare a bit off the pay checks of some of the fair-haired sons-in-laws of some of your bank officials instead of trying to get it all out of the men in the shop?

Of course the G. M. didn't like it. But he must have had more horse sense than many, because he didn't put through the wage cut, he didn't fire Tom, and he's asking the sales manager and the engineering department some embarrasing questions.

Ample Tungsten Resources in the United States

No serious shortage of tungsten, a metal used to make alloy steel for high-speed cutting tools is anticipated despite the fact that shipments of tungsten ore concentrates from China have fallen off sharply. American resources of good grade tungsten ores are generally considered adequate to supply domestic needs.

Approximately 35 per cent of the world's production of tungsten ore concentrates is consumed in this country, while only about 12 per cent of the world output is produced here. During 1936 China supplied about 72 per cent of the nearly 6,650,000 pounds of tungsten ore and concentrates shipped into this country. British Malaya was the next most important foreign source, supplying about 11 per cent. Between 80 and 85 per cent of the total American consumption is used by the steel industry, the remainder going into electric lamp filaments, radio and X-ray tubes, etc.

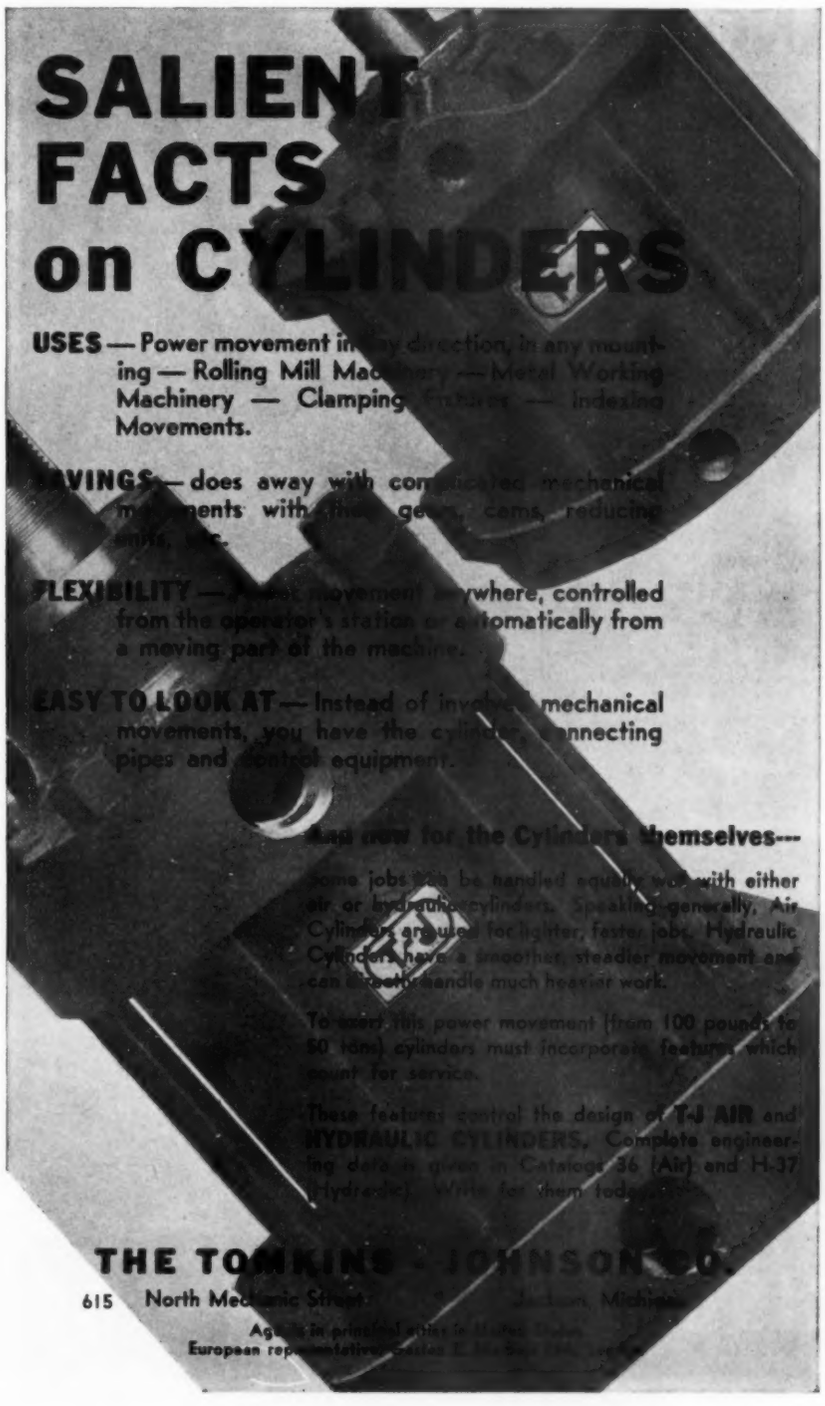
Chinese tungsten ore is generally less expensive than ore from other sources because there it lies free on the surface of the ground and does not have to be mined. Natives pick up pieces of what they call "black stone" and sell these to itinerant dealers who, in turn, sell to the Chinese government interests which concentrate the ore and supervise distribution and sale abroad.

Tungsten prices have increased greatly within recent months, bringing the price above the level at which American tungsten producers, whose mines are as deep as 3000 feet, can profitably operate. American ores are not low grade, but the mining methods which must be used are far more complicated and expensive than the very simple methods of collection prevailing in China.

Abstracted from *Steel Facts* published by the American Iron & Steel Institute.

Setback for Streamlining

So accustomed have we become tc the designation "streamlined," whether it be for pedestals or perambulators and without the slight-



est relation to aerodynamic needs, that it is somewhat of a shock to hear of a new development that directly disavows streamlining. However, this is the case in an order for 250 new coaches for underground trains ordered by the London Passenger Transport Board at a cost of £6,000,000. According to *Industrial Britain,* the board experiments have proved there is no advantage either in speed or economy of operation to compensate for the loss of seating capacity in streamlined coaches.

Handling Materials Through Preliminary Baths

JOHN F. HYLER

Mechanical handling of relatively heavy parts into and out of hot chemical baths, hot water baths, or tanks filled with varnishes or other finishing materials may be done in different ways with relative ease. In many cases it may pay to have a conveyor of the chain type developed or planned in such a manner that it will carry parts through such baths. In some cases mechanical hoists have been used in connection with monorails. One section of the monorail was so arranged that it could be dropped down and lifted back in place by an air hoist. The movable section of the monorail was, of course, attached to the hoisting element. Doubtless the same effect could be obtained with a hydraulic hoist.

In many cases the use of an air or hydraulic hoist fitted with a sensitive valve could be used to advantage in this way for high-class dipping work. It is known to those skilled in finishing work by the dipping process that if and when the work can be slowly raised from a tank of finishing material, making the rate of rise equal to the flow of the material, a very smooth job can be obtained.

It will be appreciated that with a sensitive valve to control the pressure in either direction in a hydraulic or an air hoist, such raising rate could be easily governed.

ANOTHER WAY

Your larger jobs,

like the one shown here, might at first glance seem to require a fairly large radial drill, but a careful study of the features and productive capacity of the new High Speed SUPER SERVICE Radial may help you to visualize a set-up like this—less costly, more efficient.

Super-Service Radials

You can save first cost, direct labor, floor space, interest and depreciation charges, and get more work per dollar with this new radial. It's proved by the experience in our own plant and in more than 300 others. May we send you complete details? Write for Bulletin R-21A.

The Cincinnati Bickford Tool Co.
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CINCINNATI BICKFORD

Spot Welding of Low-Alloy Steels

In broad terms, spot welding is the joining of metal sheets by means of a series of localized points of fusion each ¼-in. spot requiring a mere fraction of a second for completion. Fusion is brought about by the passage of electric current through the parts to be jointd, the current being supplied by two electrodes, which also serve to hold the sheet in contact at the spot.

Spot welding, then, depends on the generation and control of heat. Ordinarily the heat is generated so non-uniformly that some of the metal in the fused zone is brought momentarily above not only its melting point, but also above its boiling point. The metallic gas at once creates enormous pressure and tends to blow the sheets apart, creating, so to say, a miniature explosion. Insofar as all alloy steels have considerably lower heat conductivity than mild, unalloyed steel, the alloy steels will always have a stronger tendency to form gas pockets.

These undesirable gas pockets may be avoided either by keeping the welding temperature below the boiling point of the metal, which is not usually practicable, or by preventing the expansion requisite for the transformation of a liquid into a gas. The latter method is commonly used and accounts for the high pressure that

is exerted on spot welding electrodes. Whereas mild steel may require a load of up to 500 lbs. on the electrodes, alloy steels require 50 to 100 per cent higher pressures.

Although the alloy steels require higher pressures, at the same time they consume 30 to 50 per cent less current than unalloyed steels. The same characteristics which required higher welding pressures, namely the comparatively low heat conductivity and high electric resistance, permit the same heat to be generated with less current, both because the actual heat produced by the passage of electric current through the steel is greater, and because the metal surrounding the weld absorbs less of the heat in the weld.

As pointed out by G. S. Mikhalapov, of the Heintz Manufacturing Company, Philadelphia, the rules for spot welding outlined above apply fundamentally to the welding of anything from brass to nuts.

From a paper presented at the eighteenth annual meeting of the American Welding Society.

Welding of Railroad Rolling Stock

Modern passenger train design calls for a structure as well balanced as the old "one-horse shay." The entire structure, which in reality is a large tube, is the load carrying member. According to V. R. Willoughby, of the American Car & Foundry Company, designers have found that welding provides the best means of obtaining this balanced structure.

The two main factors in passenger cars are appearance and weight. In the well-known Zephyrs and the Budd-Michelin stainless steel self-propelled rail cars, both splendid appearance and light weight are achieved by the use of spot welding in the car itself and of arc or gas welding in the frame.

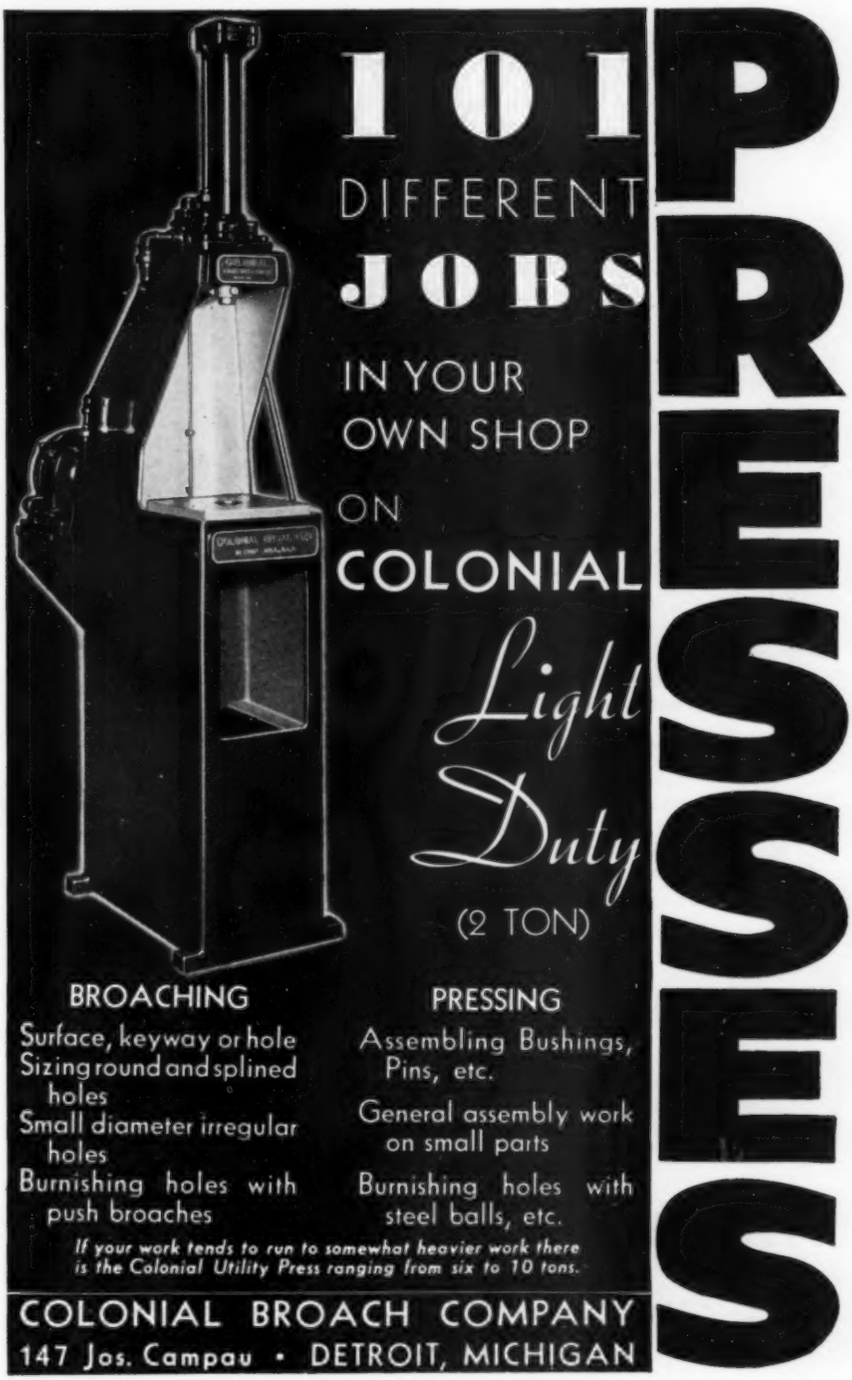
Freight car construction demands light weight primarily. That excessive weight can be cut off by welding is proved by the 70-ton hopper cars built by Pullman. The welded car weighed 45,900 lb. compared with 50,200 lb. for the lightest riveted design. The welded car could, therefore, carry 165,100 lb. of pay load whereas the load-carrying capacity of the riveted car was only 159,800 lb. This difference of 2.7 per cent becomes highly significant when the mileage of the average car is considered.

In addition to light weight the welded car must show a good service record. Welded cars have behaved with entire satisfaction since 1930. Skillful designers also make use of other advantages of welding. For example, the free discharge of cement from hopper cars practically requires the smooth interiors made possible by welding. Alloy steel and aluminum cars as well as tank cars for liquified gasses have also been welded with entire success.

From an address before the eighteenth annual meeting of the American Welding Society.

Building Up Locomotive Driving Boxes

"Building up" is a term that has been used by engineers ever since the introduction of welding. For weld metal may be deposited on a part wherever desired in order to build it up; that is, to increase the dimensions of the part. The building up process is now being applied to the driving boxes of locomotves, as explained by Irving T. Bennett of Re-



vere Copper & Brass, Incorporated.

The locomotive driving box has a metal lining which accommodates the large driving wheels during occasional misalignment, as in rounding a curve. In the past it was customary to cast bronze on the face of the driving box to produce the lining. These cast bronzes were a source of trouble, and welding is now used to produce a built-up lining of vastly superior wearing qualities.

The welder simply deposits as many layers of bronze as necessary on the iron driving box. The bronze is supplied by an electrode made of Herculoy containing 96 copper, 3½ silicon, ½ per cent tin. The electrode is ½-in. round and is covered with a fluxing material which protects the bronze from burning as it melts from the electrode on to the iron driving box under the influence of a welding current of 650 amp. The molten bronze alloys to some extent with the iron and, therefore, is firmly bonded. New boxes are lined in about forty minutes.

The performance of the arc welded linings is judged by the interval between repairs. The old style cast linings required renewal every 30,000 miles or so, whereas the built-up linings have a life of up to 120,000 miles. Although the driving box lining is only one of a great number of locomotive parts, nearly $100 per locomotive is saved by the use of built-up welded linings.

From a paper presented at the eighteenth annual meeting of The American Welding Society.

Another Cure for Snake Bites

Among British patent specifications recently accepted is one for a special knife containing an outfit to deal with snake bites. These knives contain a small lance with which the puncture of a snake bite may be probed or cut, and fitted in the handle is a specially effective antidote for the poison. According to *Industrial Britain* this article is to be manufactured by Needham, Veall & Tyzack, a Sheffield cutlery firm.

Reamer Rules

Oftentimes reamers especially designed to meet requirements of a specific difficult job suddenly stop functioning although originally operating satisfactorily. Wetmore Reamer Company has found that grinding is not the only thing being done incorrectly. Simple things are often neglected with consequent loss in tool efficiency and tool life. Good rules are:

1. Blades should not be backed off to a sharp cutting edge if you want to keep the reamer from digging in or chattering.
2. Before adjusting a reamer remove all chips by washing in gasoline or kerosene.
3. When sharpening a reamer on a 45-deg. angle don't grind into the reamer body on the cutting end.
4. Be sure to tighten the cone and lock nuts before grinding a reamer.
5. Do not turn a reamer backwards.
6. Reamer diameter at the rear should be smaller than the cutting diameter.
7. Cutting edge of the blade should not be honed.
8. Striking cutting edges with a hammer is NOT a way of adjusting the blades.

T P

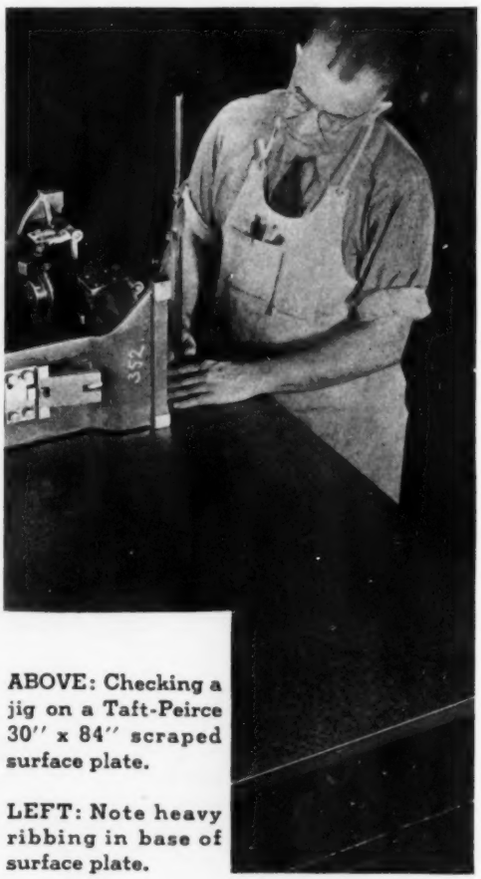
BASE Your Precision Inspection . . . on Taft-Peirce Surface Plates

For proper checking of tools, dies, jigs and fixtures, Taft-Peirce Surface Plates provide a flat basis that's the standard of accuracy in toolrooms the country over. And they are exceptionally rigid . . . extra-heavy.

These plates are furnished with either planed or scraped surfaces, in a range of 17 sizes from 8" x 10" to 48" x 144". Special sizes can be supplied promptly on order. Extra thickness of top permits surfaces to be replaned and rescraped whenever desired.

Grooved plates for lapping can also be furnished on order.

Detailed information on Taft-Peirce Surface Plates is given in the New Handbook. Write for your copy today. No obligation.



ABOVE: Checking a jig on a Taft-Peirce 30" x 84" scraped surface plate.

LEFT: Note heavy ribbing in base of surface plate.

THE TAFT-PEIRCE MFG. CO.

WOONSOCKET T P RHODE ISLAND

"TAKE IT TO TAFT-PEIRCE"

9. Grind the front edge of the blades to their original projection after adjusting reamer for regrinding.

10. Grind each reamer for a particular material. Don't use a reamer ground for steel or cast iron on brass or bronze.

11. Remember—you can't expect a dull reamer to ream a smooth hole.

Sweeping Needs

H. W. TEICHROW
Coordinator, The St. Paul Vocational School

Instead of requiring the apprentice to begin by sweeping the floor, as in the shop described by J. Homewood (AM—Vol. 82, page 182), why not make a clean sweep of it and start in with a job that requires thinking? It is difficult to see the relationship between pushing a broom and learning to be a machinist. Apprentices worthy of the name should not be wasting company time doing the work of cheap help. They should be assigned to foremen interested in training and placed under the direct supervision of a sympathetic skilled worker who has job pride enough to want to instruct the youngster.

What are some things a broom pusher apprentice can learn about the machinist trade? He can, if his spirit is not broken in the meantime, learn much about human nature, about men and machines and the chips they drop. But the chips dropped by the men do little of value to make the sweeper have job pride. For those "chips" are the words he overhears, of doubtful value for an ambitious youngster. Up and down the aisle, in and out, and around and under the machines, maybe he can acquire some knowledge, but it is certainly not organized information. Perhaps it is good for him because it tests him out to see if he can take it, while he waits for the day when he can begin to receive instruction in doing a real job, because normally he wants to feel that somebody else understands, wants or needs him. Broom pushing is not satisfying employment for the mentality required of a good machinist. Or is it?

"So what?" An employer of machinists, enough of them to warrant one or more apprentices, should plan an apprentice training program, the objective being to have his own journeyman, well trained at the end of four years. Instead of using broom pushing as a device for apprentice selection, the employer ought to dust off his own mental cobwebs and look to the trade school for aid in selection. If he feels that the trade school can't be of much help, it is a safe guess that he was not bothered much about acquainting himself with what public money in vocational education is doing. Even in those communities too small to justify a trade school, up-to-date superintendents of public instruction can offer valuable aid in apprentice selection and training.

Smart oldsters may rant about modern youth, but if the employment policies of their companies are so warped and unsound that apprentice hiring is one of taking care of somebody's kid just to do that somebody a favor, in the half hope that he will "turn out all right," then a broom pusher is what they get and deserve.

16" x 8' South Bend Quick Change Gear Underneath Belt Motor Driven Precision Lathe on a manufacturing operation.

THE new 16-inch South Bend Series "T" Lathe, with its double wall apron construction, heat treated headstock spindle, and powerful, quiet underneath belt motor drive is the most popular modern lathe for the manufacturing plant, machine shop, and tool room. The lathe has precision for tool and gauge work, rigidity and power for duplicate manufacturing operations, and versatility for the many jobs in the machine shop. An all-around lathe at a price the smallest shop can afford.

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16" lathe prices start at $642

Write FOR BULLETIN

Bulletin No. 16-C illustrates, describes and prices the different models of the 16-inch lathe. Copy sent free, upon request.

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MODERN LATHES FOR MODERN INDUSTRY

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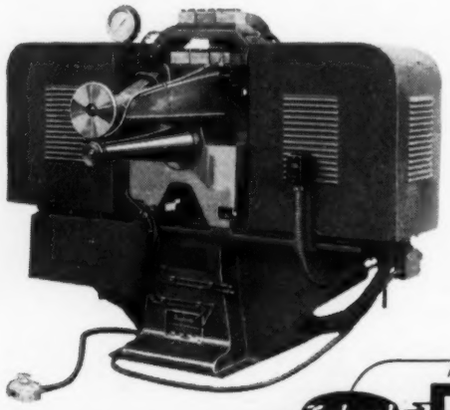
BECOMES AN INDISPENSABLE FABRICATION TOOL

The greater practicability of resistance welding cannot be challenged. Its many advantages over other fabrication methods . . its speedier, more efficient and more economical production . . have been tested over a long period of time and found not only highly satisfactory but actually indispensable. Where engineering design, for obvious reasons, calls for the use of non-ferrous metals, such as aluminum and aluminum alloys, as in the aircraft industry, Federal Resistance Spot and Seam Welders are employed constantly as an important method of fabrication and assembly. America's great bombers, for example, built to the most rigid government requirements, are making use of spot welded construction. Other industries, large and small, requiring the fabrication of both ferrous and non-ferrous metals in the construction of machines or products, also find Resistance Welding simplifying production problems and lowering production costs. Are you utilizing its possibilities? The advisory services of Federal Welding Engineers, with 27 years of experience in the designing of special and standard welding equipment, are available without obligation.



The special Federal Circular Seam Welder, here illustrated, is designed for aluminum alloys up to a maximum of two pieces of 1/8" thick material. Lower spindle is driven through a two speed motor and Reeves vari-speed drive with every possible aid for flexibility and maximum clearance. Two 200 KVA transformers in parallel give nominal rating of 400 KVA with separate auto transformers or phase shifting for heat regulation. Throat depth is 24" with 4" vertical adjustment of upper electrode. Pressure on electrodes applied by air with provisions for manually bringing electrodes together for checking alignment.

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